

OPERATIVE SURGERY

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PREFACE

Thanks for ALLAH most merciful who gives me confidence to exert this effort.
These concise notes of "operative surgery" are designed to focus on basics which are essential for surgical practice.

It may be a "handbook" for students, house officers, residents and mature surgeons.
I hope that all will obtain much value from these simple notes...

Prof. Gamal Sayed Saleh

November, 2008

DEDICATION

To pure spirits of my father & mother The great teachers and lovers

To pure spirit of Prof. Abdelazim Rifaat The great surgeon

بسم الله الرحمن الرحيم

" رب أوزعني أن أشكر نعمتك التي أنعمت عليّ و على والدي و أن أعمل صالحاً ترضاه "

وأصلح لي في ذريتي إني تبت إليك و إني من المسلمين " (سورة الأحقاف آية 15)

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- Thyroidectomy.
- Abdominal incisions.
- Cholecystectomy.
- Laparoscopic cholecystectomy.
- Appendicectomy.
- Splenectomy.
- Repair of inguinal hernias .
- Repair of femoral hernia .
- Repair of paraumbilical hernia .
- Haemorrhoidectomy.
- Operation for hydrococele.
- Operation for varicocele.
- Operation for varicose veins.
- Amputations.
- Instruments.

Thyroidectomy

TYPES :

- * **Enucleation** = excision of affected nodule (without devascularization). Obsolete.!
 - * **Partial thyroidectomy** = excision of both lobes & isthmus, leaving postero-medial part of each lobe equal to normal lobe (size of distal phalanx) to protect RLN & parathyroid glands...
 - * **Subtotal thyroidectomy** = excision of both lobes & isthmus, leaving postero-medial part of each lobe equal to 1/2 or 1/3 of normal lobe (size of 1/2 or 1/3 of distal phalanx) to protect RLN & parathyroid glands...
 - * **Hemi-thyroidectomy** = excision of one lobe & isthmus, leaving postero-medial part of this lobe
 - * **Near-total thyroidectomy** = excision of both lobes & isthmus, leaving just a postero-medial rim of thyroid tissue enough to protect RLN & parathyroids..
 - * **Total thyroidectomy** = excision of both lobes & isthmus, leaving nothing, but trying to protect RLN, and to preserve at least one parathyroid gland...!
- NB: If parathyroid glands are removed, one may be "implanted" in sternomastoid .!

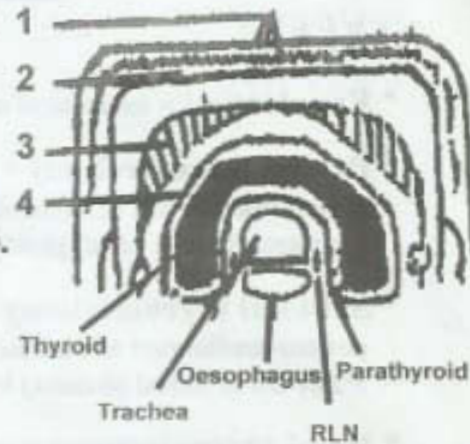
INDICATIONS :

1. Solitary nodule : **hemi-thyroidectomy (or enucleation).**
2. Simple multinodular goiter : **partial thyroidectomy.**
3. Toxic goiter (1ry or 2ry) : **subtotal thyroidectomy.**
4. Follicular thyroid carcinoma : **near-total thyroidectomy.**
5. Papillary & anaplastic carcinoma : **total thyroidectomy.**
6. Riedel's thyroiditis (with severe pressure symptoms): **isthmectomy.**

During exposure of "thyroid gland",
 imagine its coverings :

1. Skin & S.F. (containing platysma).
2. Investing layer of D.F. of neck.
3. Pre-tracheal muscles.
4. Pre-tracheal fascia (of D.F. of neck).

These coverings are "incised" to
 "deliver" the gland into the wound

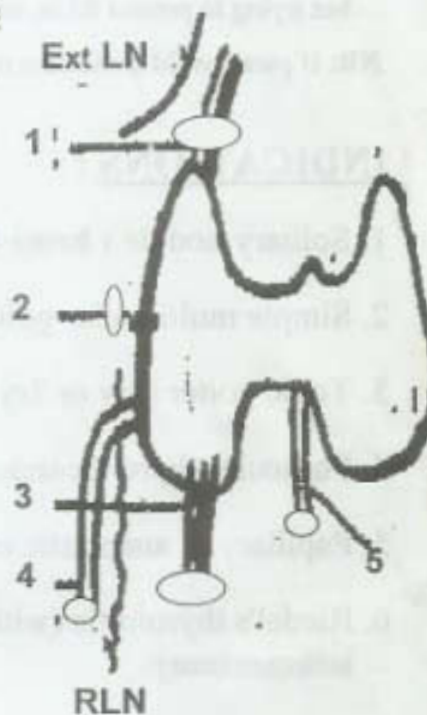


Coverings of thyroid gland

Imagine blood supply to ligate & divide

It (devascularization) before excision :

1. Superior thyroid A & V :
 enter upper pole of lobes, running with
 external laryngeal N.
2. Middle thyroid V :
 enters middle of each lobe.
3. Inferior thyroid Vv :
 enters lower pole of each lobe
4. Inferior thyroid A :
 enters lower lateral aspect of each lobe,
 running with recurrent laryngeal N.
5. Thyroid ima A (in 3%) :
 enters lower margin of isthmus (to left).



SUBTOTAL THYROIDECTOMY

* **ANAESTHESIA:** General - Endotracheal.

* **POSITION:** supine with hyper-extended neck.

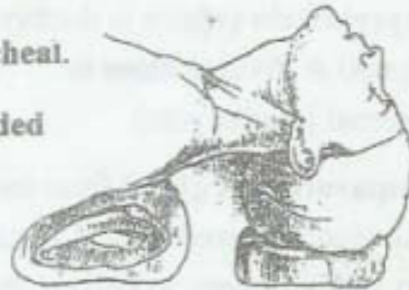
* **TECHNIQUE :**

I- Exposure of thyroid :

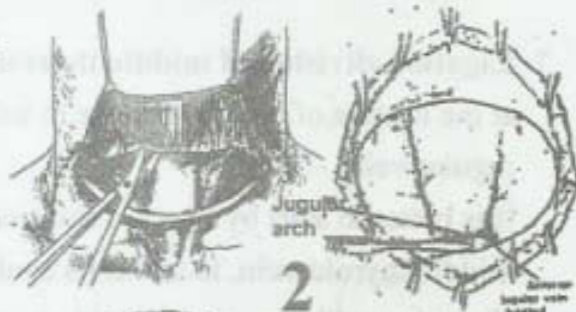
1- **INCISION :** Low collar incision :

- * 2 fingers above suprasternal notch,
- * extending from posterior border of one sternomastoid to the other...

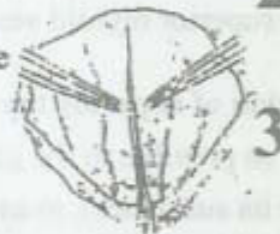
Incision must include skin, S.F. containing platysma as "one flap".



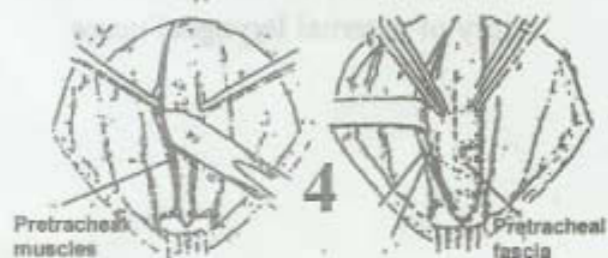
2- **Dissection & elevation of flap** up to hyoid bone & down to suprasternal notch to expose investing layer of D.F. of neck.



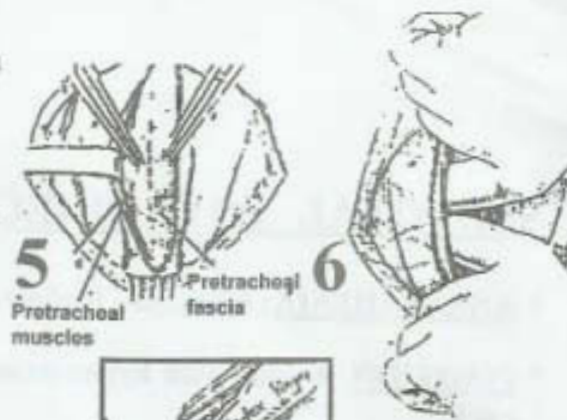
3- **Incision of investing layer of D.F. of neck vertically in midline (& separation of it) to expose pre-tracheal muscles.**



4- **Separation of pre-tracheal muscles in midline to sides, to expose pre-tracheal fascia (closely related to gland).**



5- Incision of pre-tracheal fascia in midline & its separation by finger from thyroid (to which it is closely related) - over **middle thyroid vein** (which is doubly ligated & divided close to internal jugular vein).



6- Separation of gland from the surrounding pre-tracheal fascia by index fingers, to deliver thyroid gland into the wound.



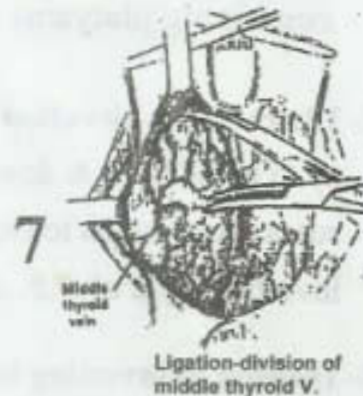
NB: Pre-tracheal muscles may be divided in huge nodular, toxic & malignant goitre... as high as possible near its upper attachment to avoid injury of their nerve supply (ansa cervicalis) coming from below.



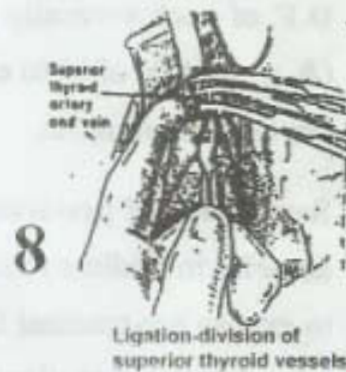
II- Devascularization of thyroid :

7- Ligation-division of middle thyroid vein at the middle of the gland close to internal jugular vein.

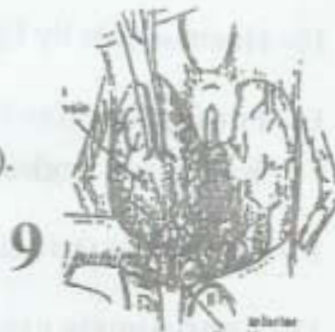
It is better to start by ligation-division of middle thyroid vein, to avoid its avulsion if starting with superior thyroid vessels.



8- Ligation-division of superior thyroid vessels as near as possible to the gland (or even inside its substance), to avoid injury of external laryngeal nerve

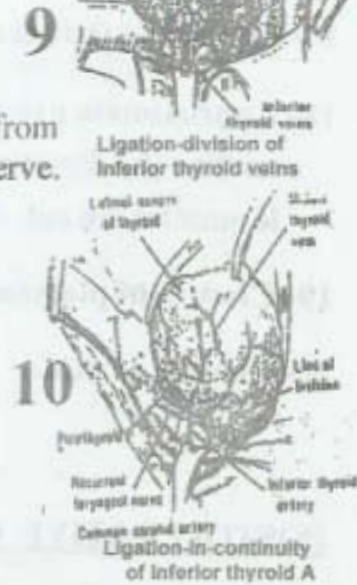


- 9- Ligation-division of inferior thyroid veins at the lower pole of gland (en-mass or separate).



- 10- Ligation-in-continuity (without division) of inferior thyroid artery, as far as possible from gland, to avoid injury of recurrent laryngeal nerve.

NB: Only one side could be ligated in case of simple nodular goitre, while both sides are ligated in toxic & malignant goiters.!



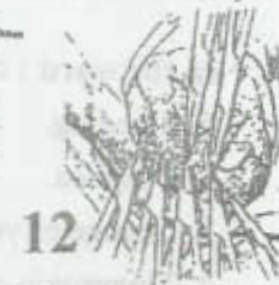
REPEAT the same steps on the other lobe...

III- Excision of thyroid :

- 11- Separation of isthmus from trachea (kocherization).



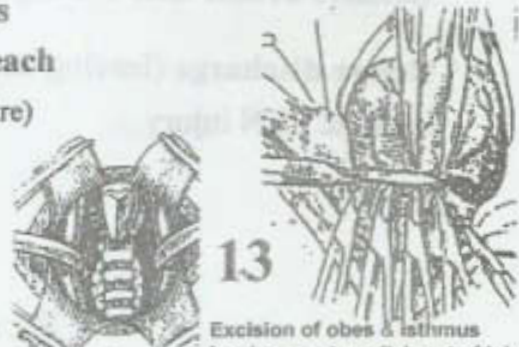
- 12- Apply series of artery forceps (or Kocher's forceps) to catch capsule of gland...



- 13- Excision of both lobes & isthmus leaving postero-medial part of each lobe (its size is according to type of goitre) to protect RLN & parathyroid glands.

Excision is from "lateral to medial".

- 14- Suturing of capsule of the gland all around to tracheal sheet...



Suturing of capsule

Excision of lobes & isthmus leaving post-medial part of lobe

IV- Closure of wound :

15- Haemostasis by ligation of all bleeders.

16- Putting 2 drains in field bringing them from lateral angles of wound.

17- Closure of D.F. at midline.

18- Approximate pre-tracheal muscles at midline (by few stitches).
If muscles are cut, they are sutured.

19- Closure of platysma as a separate layer.

20- Closure of skin.

16



18



19



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Closure with drainage

POSTOPERATIVE CARE :

* **In theatre** : after extubation, examine vocal cords on table.

* **In the ward** : observe for early complications :

1. Bleeding.
2. Dyspnea.
3. Change of voice.
4. Thyrotoxic crisis (high fever, tachycardia, dyspnea, irritability,...).

* **Remove drains** after 1-2 days & **remove stitches** after 4 days.

* **Before discharge** (leaving hospital) : **examine vocal cords** to exclude RLN injury...

POSTOPERATIVE COMPLICATIONS :

Early complications : (first day of operation)

1. Bleeding (reactionary haemorrhage) may compress trachea → suffocation...
Treatment : immediate opening of wound to ligate bleeders under general anaesthesia...
2. Dyspnea due to :
 - Reactionary haemorrhage. *Treatment :* see above...
 - Bilateral incomplete RLN injury. *Treatment:* urgent tracheostomy.
 - Laryngeal oedema. *Treatment :* medical... or tracheostomy.
 - Thyrotoxic heart failure. *Treatment :* inderal + digitalis.
3. Change of voice : may be
 - Hoarseness of voice = unilateral RLN injury (complete or incomp.).
 - Aphonia = bilateral complete RLN injury.
 - Loss of high-pitched voice = external laryngeal nerve injury
4. Thyrotoxic crisis :
 - = High fever, tachycardia, arrhythmias, dyspnea, irritability & even convulsions...
 - Treatment :* cold compresses + IV fluids with Lugol's iodine drip + inderal + hydrocortisone + largactil.

Late complications : (few days after operation)

5. Hypothyroidism (when no enough thyroid tissue is left).
Treatment : L-thyroxine for life.
6. Hypo-parathyroidism (when all parathyroids are removed or their vessels are injured) → cramps few days after operation (tetany).
Treatment :
Emergency : 10% calcium gluconate 20 ml slowly IV.
Maintenance : calcium + vitamin D (orally).
7. Recurrence.
8. Keloid in scar.
9. Progressive exophthalmos following thyroidectomy for cases of 1ry toxic goitre with exophthalmos that receive antithyroid drugs less than 6 months.
Treatment : thyroxine + cortisone + protection of eyes (by sleeping semi-sitting & lateral tarsorrhaphy).

ABDOMINAL INCISIONS

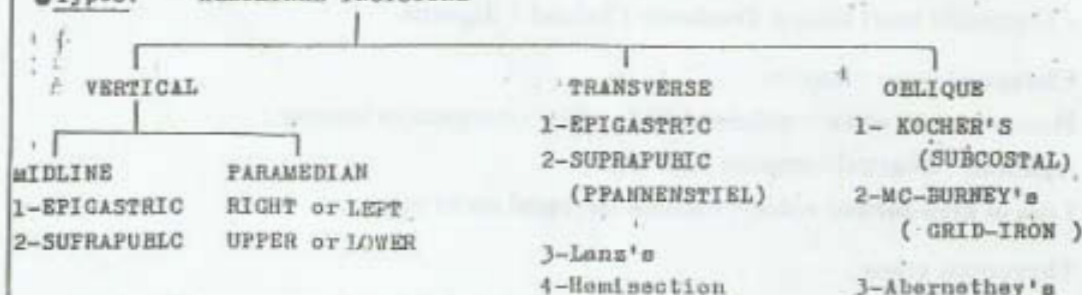
● Ideal abdominal incision should have 4 CHARACTERS:

- 1- Accessible = gives adequate exposure.
- 2- Extensible = can be widened easily (if needed)
- 3- Safe = causes minimal damage to abdominal wall.
- 4- Cosmetic = good appearance in skin (esp. in females.)

● PRINCIPLES:

- Splitting muscles in direction of their fibres is more "safe" than cutting across them.
- Not to divide nerves.
- Not to insert drains in the main wound but in a separate small incision.
- Not to close the wound before careful haemostasis → hematoma → infection.
- Not to close the wound under tension → ischaemia → wound disruption.

● Types: ABDOMINAL INCISIONS



● CLASSIFICATION of abdominal incisions according to "underlying muscles" :

- 1- MUSCLE-SPLITTING incisions e.g. McBurney's, Lanz, paramedian incisions...
- 2- MUSCLE-CUTTING e.g. Kocher's, Abernethy's,



Epigastric Midline



Right and Left Upper paramedian



Epigastric Transverse



Kocher's (Subcostal) Right and Left



Suprapubic Midline



Right and Left Lower paramedian



Suprapubic Transverse



McBurney's (Grid-iron)



Exploratory



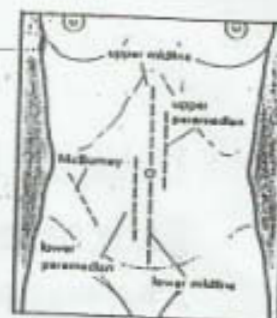
Lanz's



Abernethy's



Hemisection

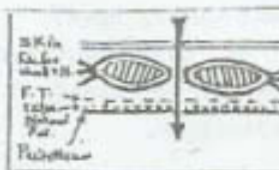


I VERTICAL INCISIONS:

1- MIDLINE INCISIONS:

* ADVANTAGES:

- . Accessible (expose both sides)
- . Extensible (easily enlarged)
- . Safe (not interfere with Ma or Mn.)
- . Rapid (in opening and closure)



* **DISADVANTAGE:** Poor healing → easy wound disruption and incisional hernia.

MIDLINE EPIGASTRIC INCISION:

Opening:

- 1- skin (from xiphisternum to umbilicus) in midline
- 2- Linea alba (wide-strong)
- 3- Fascia trans., extraperitoneal fat and peritoneum.

NB: If extension is needed:

- . Upwards by excising xiphoid process..
- . Downwards by cutting around umbilicus usually to left to avoid falciform ligament (to right).

CLOSURE:

- 1- Peritoneum with fascia transversalis (continuous catgut).
- 2- Linea alba (interrupted catgut or proline).
- 3- Skin (" silk).



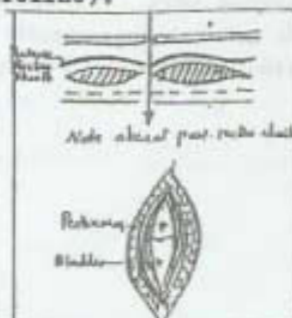
MIDLINE SUPRAPUBIC INCISION:

Opening:

- 1- Skin (from umbilicus to symphysis pubis) in midline.
- 2- Linea alba (narrow-thin). It lies mainly in front of recti with NO post. rectus sheath in lower half.....
- 3- Separation of recti: to expose bladder (below) and peritoneum (above) which is stripped upwards to expose bladder.
- 0 Fasc. trans., extra.perit. fat and peritoneum: may be opened in the midline to expose intraperitoneal organs.

CLOSURE:

- 1- Peritoneum if opened (continuous catgut).
- 2- Linea alba (interrupted catgut or proline).
- 3- Skin (" silk).

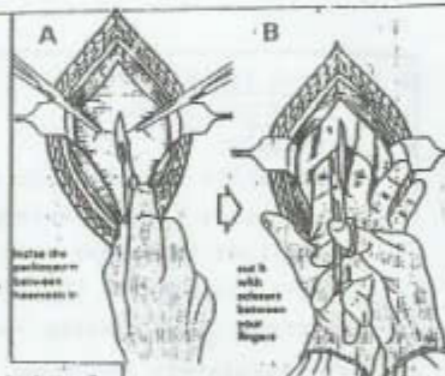


2- PARAMEDIAN INCISION:

* ADVANTAGES: (most widely used).

- . Accessible ... So that Right Paramedian (paraumbilical) incision is the standard one for EXPLORATORY LAPAROTOMY.
- . Extensible .
- . Safe: not injure any muscle, nerve or vessel.

- . Strong ("trap-door effect" of rectus muscle) = lateral displacement of rectus m. during opening and its replacement during closure.



ENTERING PERITONEAL CAVITY

* DISADVANTAGE: time-consuming.

* Opening:

- 1- Skin: in a line parallel to midline (1 inch from it).
It may be upper (Right or left) = supra-umbilical .
or lower : (" " ") = infra-umbilical.
- 2- Ant. rectus sheath: in same line of skin incision
- 3- Rectus muscle is retracted laterally (not incised) to expose post. rectus sheath (it may be incised medially = "Trans-rectal incision", but it gives a weak scar and it loses "trap-door effect").
- 4- Post. rectus sheath if above arcuate line", (but if below it, there is No post. rectus sheath)
- 5- Fascia transversalis, extraperit. fat and peritoneum.

III: Post. rectus sheath and peritoneum are usually opened as one layer.

III: In "lower para-median incision": after opening of anterior rectus sheath, there will be 3 differences:

- . Pyramidalis muscle runs upwards from pubis on medial side of rectus muscle.
- . No post. rectus sheath in lower $\frac{1}{2}$ of wound.
- . Inferior epigastric vessels run upwards medially towards umbilicus (they require division and ligation).

* CLOSURE:

1. Peritoneum and post. rectus sheath as one layer (continuous catgut).
2. Rectus m. is returned back (if transected: few interrupted sutures are taken to approximate its edges - of catgut).
3. Ant. rectus sheath. (interrupted catgut or proline).
4. Skin (" silk).



II TRANSVERSE INCISION:

1- TRANSVERSE EPIGASTRIC INCISION:

* ADVANTAGES:

- . Accessible: expose all structures in upper abdomen.
- . Extensible.
- . Safe: because division of recti does not interfere with their function and strength, as nerve supply has a segmental distribution.
- . Cosmetic: as skin incision lies on Langer's lines.

* DISADVANTAGES: time-consuming.

Also, excessive bleeding from division of superior epigastric vessels.

* Opening:

- 1- Skin: midway between xiphisternum and umbilicus.
- 2- Ant. rectus sheath on both sides (in line of incision).
- 3- Recti muscles " " " (" " " ").
- 4- Post. rectus sheath " " " (" " " ").
- 5- Peritoneum.....

* CLOSURE:

- 1- Peritoneum and post. rectus sheath as one layer (continuous) catgut).
- 2- Recti are left in situ (Not sutured).
- 3- Ant. rectus sheath (interrupted catgut or proline).
- 4- Skin (" silk).

2- TRANSVERSE SUPRAPUBIC INCISION: (PEANNENSTIEL)

* ADVANTAGES:

- . Accessible: gives a good access to pelvic viscera.
- . Cosmetic: gives a thin scar....

* OPENING:

- 1- Skin: a little below midpoint between umbilicus and symphysis pubis from one linea semilunaris to the other.
 - 2- Ant. rectus sheath: in same line of incision.
 - 3- Recti ms. are separated (vertically).
 - 4- F. transversalis, extraper. fat and peritoneum: vertically.
- NB: No post. rectus sheath in infraumbilical region.

* CLOSURE:

- 1- Peritoneum and f. transversalis (continuous catgut).
- 2- Recti are approximated (few interrupted catgut).
- 3- Ant. rectus sheath (interrupted catgut or proline).
- 4- skin (interrupted silk).

LANZ'S INCISION:

= A modification of Mc-Burney's incision in which it curves transversely from just medial to ant. sup. iliac spine along interspinous crease (invisible scar).

* Opening and closure: the same as in Mc-Burney's incision, with advantage of "Accessibility" i.e. it can be prolonged with medial retraction of rectus if needed.



HEMISECTION INCISION:

- = a transverse incision on one side of abdomen, from outer border of sacrospinalis to umbilicus. In this incision, 3 flat muscles are divided in the same line of incision... It gives good access to flexures of colon, it can be extensible and it may be combined with a paramedian incision

III OBLIQUE INCISIONS:

1- KOCHER'S SUBCOSTAL INCISION: (Right or left)

- * **Advantage:** gives good access to biliary passages on right side and spleen on left side.
- * **Disadvantages:** - cannot be enlarged freely.
- damage of 8,9,10th intercostal nerves.

Opening:

- 1- Skin: 1 inch below and parallel to costal margin, from the midline to ant. axillary line.
- 2- Ant. rectus sheath, rectus muscle and post rectus sheath medially and 3 flat muscles: (ext oblique, int. Oblique and trans. abdominis) laterally, in the same line of incision...

NB: All are divided. Rectus m. is divided -MUSCLE SPLITTING INCISION. (8,9,10th intercostal nerves run between int. oblique and trans. abd. may be cut).

8th nerve can be sacrificed, but others must be preserved.

- 3- P. transversalis and peritoneum: in same line of incision

CLOSURE:

- 1- Peritoneum and post. rectus sheath (continuous suture).
- 2- Int. oblique and trans abd. as one layer (interrupted " ").
- 3- Ext. oblique and ant. rectus sheath (interrupted " ").
- 4- Skin (interrupted silk).

2- Mc-BURNEY'S (grid-iron) INCISION:

- * **Advantages:** - gives direct access to normally-situated appendix.
- gives small scar (cosmetically good).

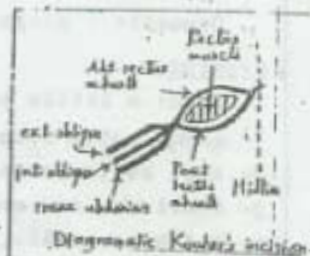
- * **DISADVANTAGES:** - Not extended freely!
- damage of ilio-inguinal nerve in 30% of cases → paralysed conjoint tendon → direct inguinal hernia.

* **Used for** appendicectomy (commonest incision) and for caecostomy or ileostomy (on right side) and for pelvic colostomy (on left side).

Opening:

- 1- Skin: 5 cm incision perpendicular to a line joining ant. sup. iliac spine to umbilicus, with its centre at Mc-Burney's point (= junction of lateral $\frac{1}{3}$ with medial $\frac{2}{3}$ of this line).

It is suggested that "Mc-Burney's point" determines constantly the base of appendix at its junction with caecum.



- 2- Ext. Oblique aponeurosis: incised in same line of skin incision.
 - 3- Int. Oblique and trans. abd.: *SPLIT* together by blunt dissection in a line perpendicular to that of skin.
- NB: above 2 layers are incised and split respectively in the same line of their muscle fibres so, it is a **MUSCLE-SPLITTING INCISION**.
- 4- P. trans. and peritoneum: incised in same line of skin incision.

* CLOSURE:

- 1- Peritoneum and P. transversalis: (continuous).catgut).
- 2- Int. oblique and trans abd.: approximated (few interrupted).catgut).
- 3- Ext oblique aponeurosis (interrupted).catgut).
- 4- skin . (" silk).

* Extension of Mc-Burney's incision:

- Medially: extend the split of int. obl. and trans. abd. into rectus sheath.
 - Upward-Downward: cut int. obl. and trans. abd perpendicular to their fibres.
- This extension is called **RUTHERFORD-MORRISON EXTENSION**. (it may predispose to incisional hernia or may cut ilio-inguinal N₂).

NB: **RUTHERFORD-MORRISON INCISION** = a modification of Mc-Burney's incision in which all muscles are divided in the same line of skin incision.

Used for drainage of "appendicular abscess".

ABERNETHY'S INCISION (Oblique iliac incision):

- * Used for extraperitoneal exposure of ureter, sympathetic trunk and external iliac vessels.

* Opening:

- 1- Skin: from a point 1½ inch above and medial to ant. sup iliac spine to a point 1 inch above mid-inguinal point.
- 2- Ext obl. aponeurosis : incised in same line of skin incision.
- 3- Int. obl. and trans. abd. muscles: * * * * *
- 4- Fascia trans. only is divided, but peritoneum is "stripped" upwards medially until psoas muscle is exposed = **EXTRAPERITONEAL APPROACH**.

* Closure: as in Mc-Burney's incision.

(Peritoneum is Not opened or closed).



Open Cholecystectomy

INDICATIONS :

- 1- Chronic calculous cholecystitis = Gall stones.
- 2- Chronic non-calculous cholecystitis resistant to medical treatment for 2 years.
- 3- Acute cholecystitis during first 24 hours.
- 4- Injuries of gall bladder.
- 5- Mucocele of gall bladder.
- 6- Torsion of gall bladder.
- 7- Carcinoma of gall bladder.

Revision of anatomy of gall bladder region :

I- During exposure of gall bladder at inferior surface of liver, imagine layers of ant. abd. wall at right hypochondrium :
(See abdominal incisions)

- 1- Skin and S.F.
- 2- Ant. rectus sheath.
- 3- Rectus abdominis muscle (with 7-12 intercostal nerves).
- 4- Posterior rectus sheath (then fascia transversalis).
- 5- Peritoneum.
- 6- Liver with gall bladder on its inferior surface.

NB: Laterally, there are 3 lateral flat muscles..

II- After exposure of gall bladder, imagine its anatomy :

- Gall bladder lies on inferior surface of liver covered by a fold of peritoneum which extends till the entry of CD into CBD (triple junction).

- CD (2-4 cm.) communicates neck of gall bladder to CHD to form CBD = Triple junction.
- Cystic A. (branch of right hepatic A.) runs deep to CD behind CHD.
- Cystic veins runs directly from GB to liver bed (NO cystic V.).

Anomalies of cystic duct (CD) :

- Absent CD.
- Very long CD.
- Accessory CD = Hepatico-cholecystic duct (from gall bladder directly to liver).

Anomalies of cystic artery (CA) :

- CA runs in front of CHD (instead of running behind it).
- Displaced right branch of Hepatic A. to become in place of proximal part of CA → wrong ligation.



Open cholecystectomy (Classic or Retrograde)

- **ANAESTHESIA** : General ,endotracheal.

- **POSITION** : supine (with bridge or sand bag under lower right ribs to facilitate operation).

- **TECHNIQUE** :

1- Exposure of GB :

1- **INCISION** :

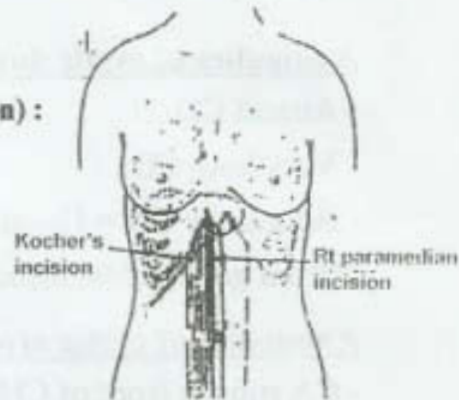
* **Kocher's incision** (right subcostal incision) :

One finger below costal margin from midline to anterior axillary line.

Gives direct exposure but not suitable for exploration & gives weak scar as it is a muscle-cutting incision (cuts 8,9,10 intercostal nerves).

* **Right paramedian incision** :

"Better" as it is suitable for exposure, NOT muscle-cutting & used if narrow costal angle.

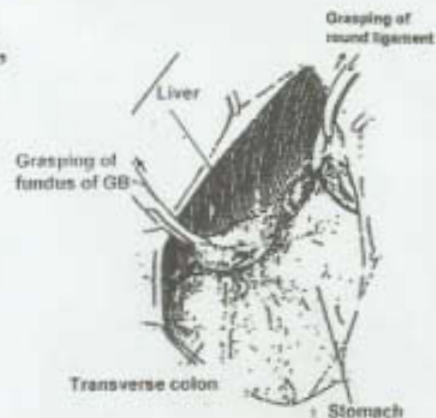


Incisions for cholecystectomy

NB: Explore for hiatus hernia, chronicDU, sigmoid diverticula or chronic appendicitis.

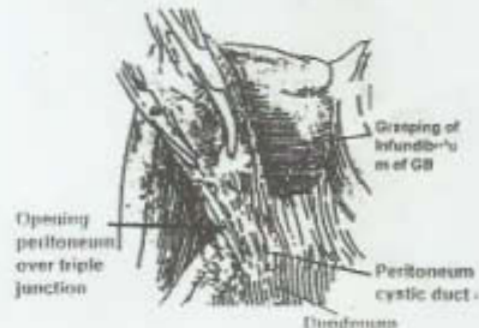
II,III- Devascularisation & Excision :

3- Expose gallbladder by catching & pulling of fundus upwards-laterally. Clear the field of gallbladder by retracting stomach medially & transverse colon and small intestine downwards...



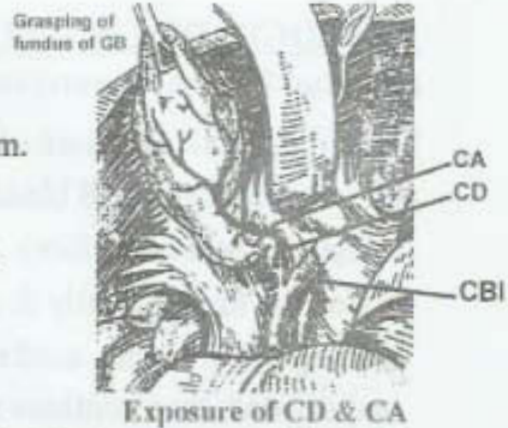
Exposure & clearing of field of GB

4- Expose "triple junction" between CD, CHD & CBD by opening of peritoneum of free border of lesser omentum to neck of GB.



Opening peritoneum to expose CD & CA

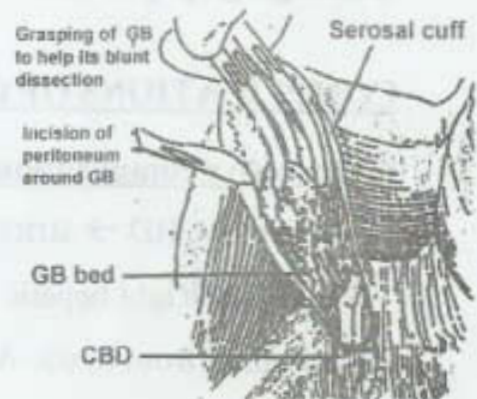
- 5- Dissection & ligation-division of cystic duct (CD) leaving stump 3 mm. Take care not to injure common bile duct (CBD) or common hepatic duct (CHD).



- 6- Dissection & ligation-division of cystic artery (CA) as near as possible to gallbladder to avoid injury of right hepatic artery.



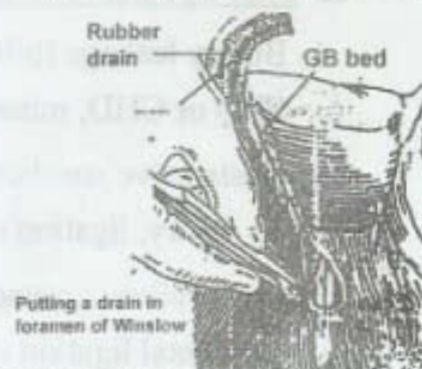
- 7- Separation of GB from its bed : by incision of peritoneum around gallbladder to make it free, then separate it from its bed by blunt dissection starting at its neck.



NB: Closure of gallbladder bed, if possible...

Separation of GB from its bed

- 8- Putting a drain in the foramen of Winslow and pass it from a separate stab in the right flank.



IV-CLOSURE OF WOUND : in layers..

Closure of GB bed & Putting a drain

RETROGRADE CHOLECYSTECTOMY

(Fundus-first cholecystectomy) :

Done if difficult exposure of region of CD (triple junction) and only fundus of gall bladder is exposed :

- Clear the field (as before)...
- Catch the fundus gently & separate gall bladder from its bed starting at its fundus, until reaching CD which will be ligated and divided, then continue as before...

POST-OPERATIVE CARE :

- Observe for complications...
- Prevent chest infection : encourage cough & early ambulation...
- Remove drain on 5th day (or when discharge stops).
- Remove stitches on 8th day (if Kocher's incision) & on 10th day (if right paramedian incision).
- If T-Tube was put, clamp it on 10th day & wait for 48 hours : if fever or colic or jaundice (Charcot's triad) → transtubal cholangiography is done to investigate cause of obstruction...

COMPLICATIONS OF CHOLECYSTECTOMY :

I- Operative complications :

- 1- Injury of CBD → stricture → Obstructive jaundice.
- 2- Injury of Right hepatic A. → massive necrosis → liver failure.
- 3- Bleeding from cystic A.

II- Post-operative complications :

- 1- Biliary leakage (biliary fistula) : caused by injury of CBD or CHD, missed stone in CBD with bursting CD stump.
- 2- Obstructive jaundice : caused by obstruction of CBD or CHD by injury, ligation or missed stone.
- 3- Liver failure : caused by massive liver necrosis due to accidental ligation or injury of Rt. hepatic A.

- 4- Post-cholecystectomy syndrome = Persistent symptoms of gallstones - due to :
- Other diseases as chronic DU or chronic appendicitis (or those of Wilkie's triad or those of Saint's triad)... (and cholecystectomy was wrongly done)...
 - Biliary dyskinesia.
 - Ligation or injury of CBD or CHD.
 - Missed stones in CBD or CHD.
 - Leaving a long cystic duct stump which enlarge causing symptoms.

Indications of exploration of CBD (Choledochotomy) :

I- Preoperative indications :

- History of Charcot's triad (rigors - biliary colic - Jaundice), or history of recurrent pancreatitis.
- IV cholangiogram shows multiple stones in CBD or if sonography shows dilated CBD Or multiple stones in it.

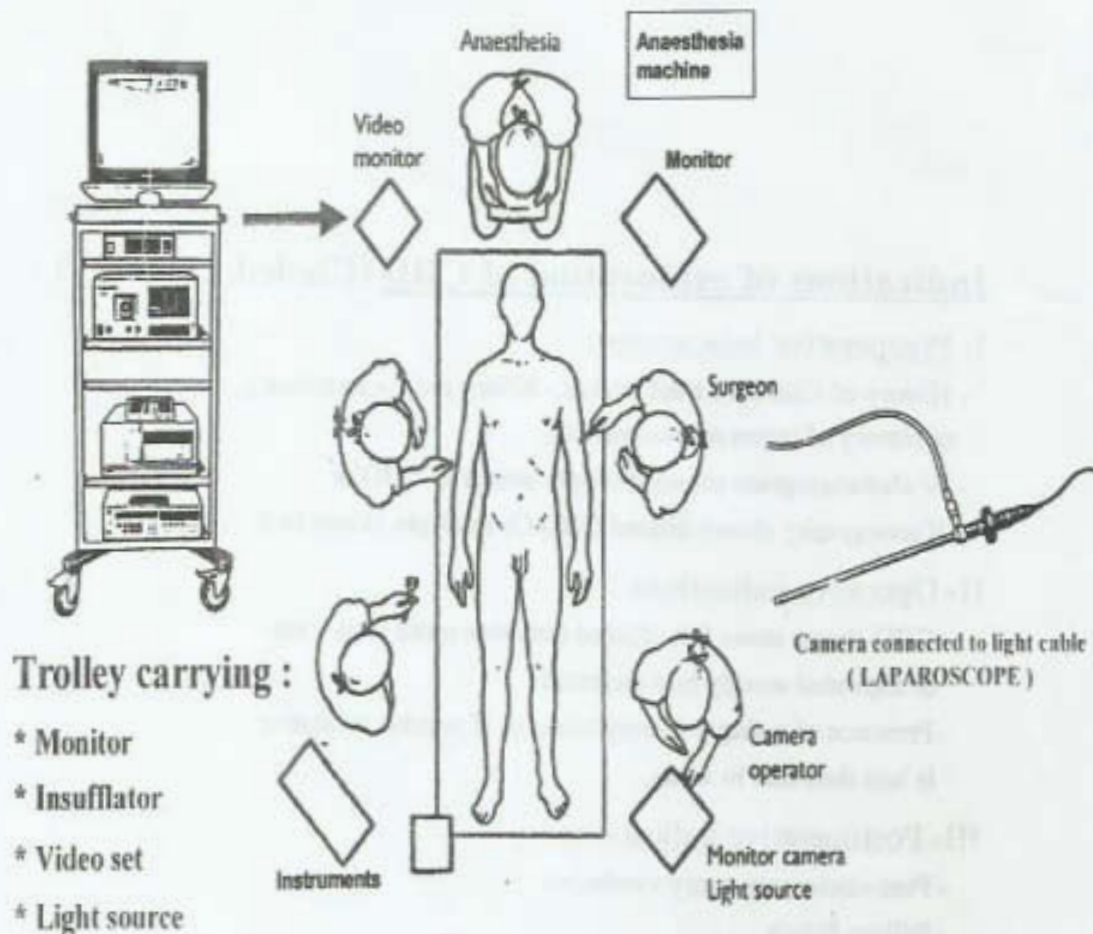
II- Operative indications :

- CBD shows stone felt, dilated diameter more than 1 cm or aspirated muddy bile (infected).
- Presence of a single faceted stone or if number of stones is less than that in x-ray.

III- Postoperative indications :

- Post-cholecystectomy syndrome.
- Biliary fistula.
- Obstructive jaundice.
- If clamping of T-tube (post-operative) → one of Charcot's triad....

Laparoscopic Cholecystectomy



Laparoscopic cholecystectomy

Indications : the same as in open cholecystectomy...

Contraindications :

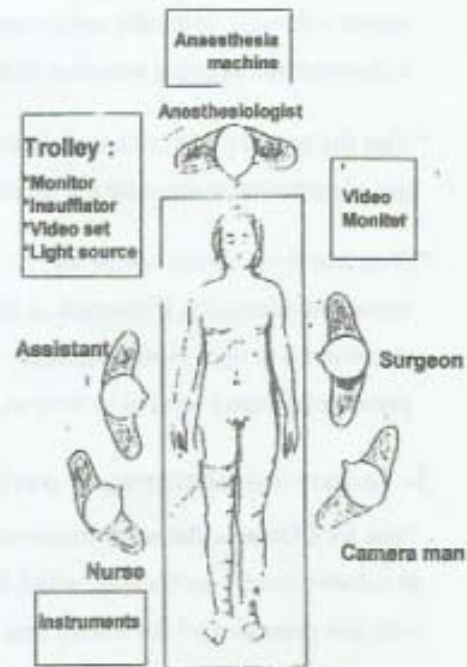
- * **Absolute :** coagulopathy, peritonitis, small intestinal obstruction & large diaphragmatic hernia.
- * **Relative :** cirrhosis, acute cholecystitis, pregnancy..

Room set-up :

- * Positions of surgeon, cameraman, 1st assistant.
- * Sites of trolley (carrying video monitor, CO2 insufflator, video set & light source) & another video monitor.

Anaesthesia : general, endotracheal.

Position : supine – with mild reversed Trendlenburg position - with slight rotation to left (right side up) for better visualization of gallbladder region.



Room set-up in lap. cholecystectomy

Incision & exposure :

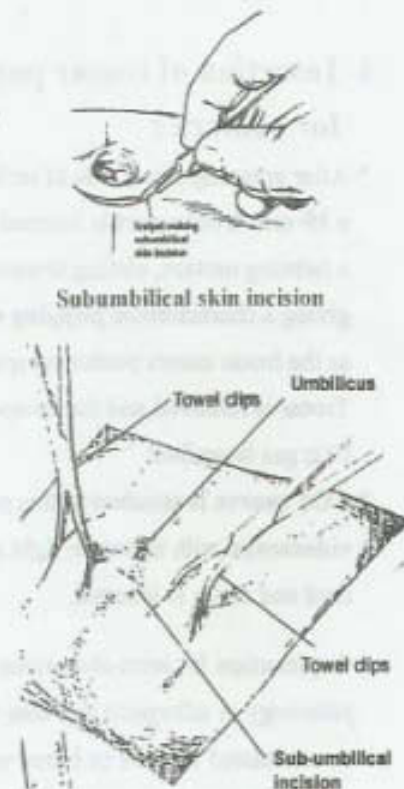
- 1- **Sub-umbilical incision :** 1 cm horizontal (or vertical) skin incision.

NB: Essential need of laparoscopic surgery is to induce pneumo-peritoneum : by insufflation of CO2 (inert gas) into peritoneal cavity through the Veress needle, then through the port of the camera at the same site..

So, Veress needle should be inserted through the sub-umbilical incision to induce pneumo-peritoneum, after which trocar port for camera is inserted through the sub-umbilical incision.

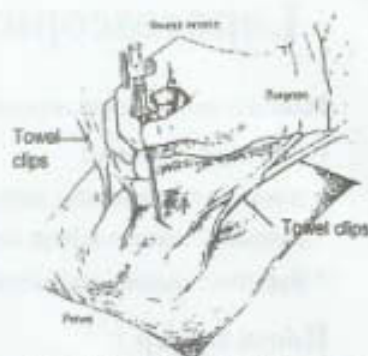
- 2- **Insertion of Versess needle :**

- * Abdominal wall on either side of umbilicus is grasped by surgeon and 1st assistant by towel clips (or by thumb and fingers) to elevate abdominal wall.



Skin incision for insertion of Veress needle & port of camera

- * Veress needle is held like a pencil by surgeon who inserts it through linea alba and peritoneum where a characteristic popping sensation is felt.
- * Test the patency of needle by saline irrigation in and out of peritoneal space, where it should give free flow.
- * If no free flow, Veress needle may be removed and reinserted. Generally, if insertion is difficult, it is safer to convert it to open mini-laparotomy with a peritoneal purse-string suture secured to the port.



Insertion of Veress needle



Saline irrigation to test for patency

3- Induction of pneumo-peritoneum :

Tube for CO₂ insufflation is connected to Veress needle to induce pneumo-peritoneum, which begins with a low flow with low pressure (5-7 cm water), then flow rate may be increased up to 15 cm water. Once 1-2 litres of CO₂ are in, abdomen becomes hyper-resonant, but 3-4 litres of CO₂ are needed to fully inflate abdomen & Veress needle is removed.

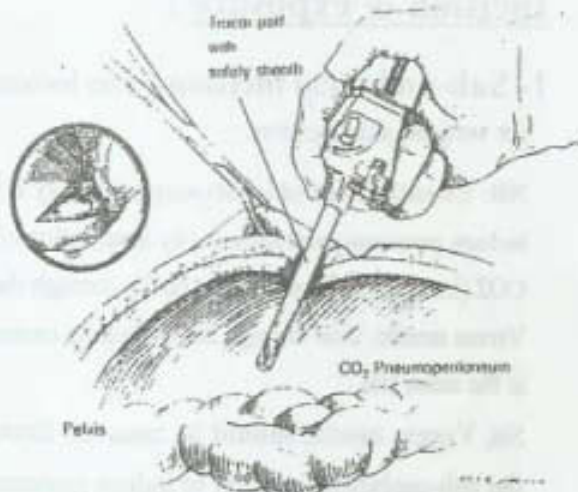
4- Insertion of trocar port for camera :

- * After grasping either side of umbilicus, a 10-mm trocar port is inserted with a twisting motion, aiming towards pelvis giving a characteristic popping sensation as the trocar enters peritoneal space.

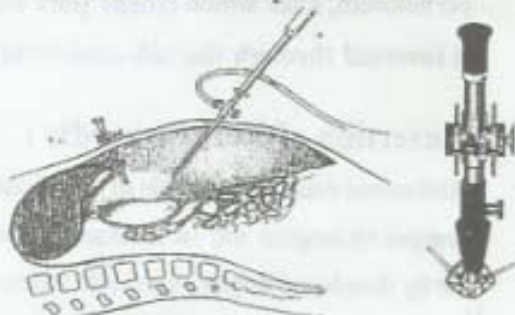
Trocar is removed and the escape of free CO₂ gas is verified.

- * CO₂ source is attached to this port and videoscope with its sterile light source cord and cover is inserted.

- * **Exploration** for intra-abdominal organs pathology or adhesions and also for any trocar-related visceral or blood vessels injuries (immediate open laparotomy for repair is done)



Insertion of trocar port for camera



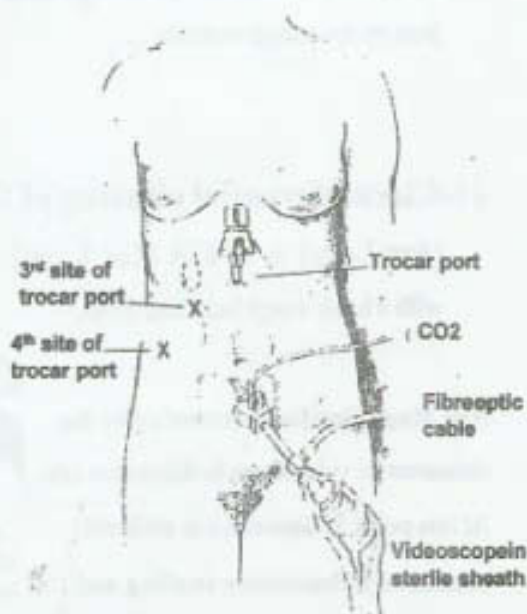
5- Insertion of 3 additional

trocar ports : Under direct vision
of their intra-abdominal penetration :

- * 10 mm trocar port in epigastrium 5 cm below xiphoid (with its intra-abdominal entrance just to right of falciform ligament).
- * 5 mm trocar port in right upper quadrant near mid-clavicular line many cms below costal margin.
- * 5mm trocar port more lateral at level of umbilicus.

NB: These sites may be modified according to anatomy of patient & experience of patient.

NB: Patient is placed in reversed Trendelenburg position (10-15 degrees) & right side up for better visualization of gallbladder region.



Sites of ports in lap. cholecystectomy

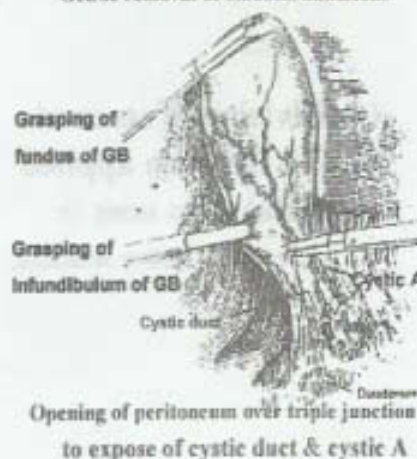
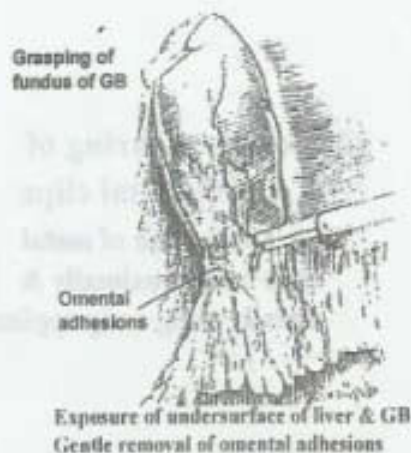
6- Grasping of fundus of gallbladder

with a ratched forceps through lateral port, then gallbladder & liver are lifted superiorly to give good exposure of undersurface of liver & GB.

7- Gentle removal (teasing) of omental & other loose adhesions from GB.

8- Grasping of infundibulum of GB with forceps through middle port – for lateral traction to expose cystic duct & artery (CD & CA).

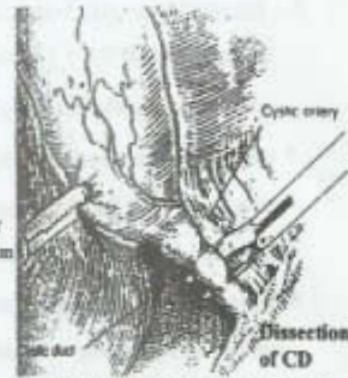
9- Opening of peritoneum over triple junction to expose of CD & CA with forceps through epigastric port by gentle teasing and spreading motions....



10-Circumferential exposure of CD

& of CA : with forceps through epigastric port by spreading motions...

Grasping of infundibulum of GB



Circumferential exposure of cystic duct & cystic A.

11-Circumferential clearing of CD

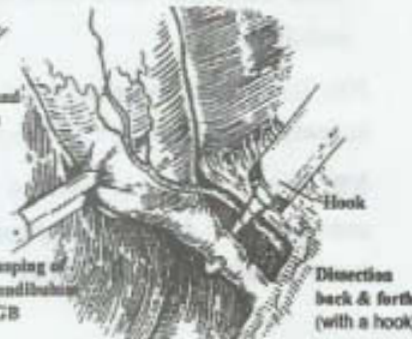
(for 2 cm) & of CA (for 1 cm) :

with a hook swept back and forth.



Dissection (with Maryland forceps)

Grasping of infundibulum of GB

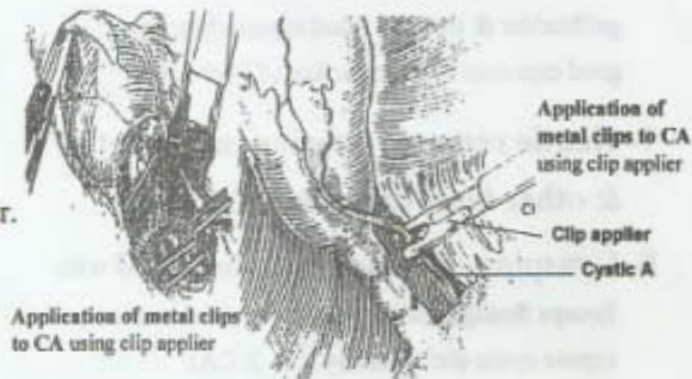


Circumferential clearing of cystic duct (for 2 cm) & clearing of cystic A. (for 1 cm).

NB: Magnification is controlled by the closeness of videoscope to dissection site.

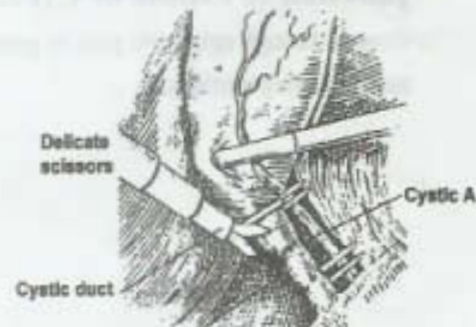
At this point, if dissection is difficult because of inflammatory swelling and scarring, the surgeon should consider conversion to open surgery...!

12- Doubly securing of CA with metal clips i.e. application of metal clips both proximally & distally using a clip applicator.



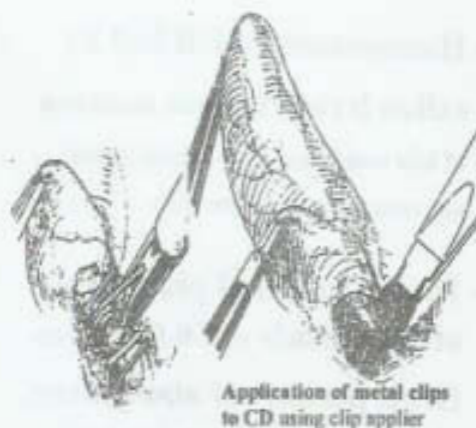
Doubly securing of Cystic A. with metal clips

13- Division of secured CA between applied metal clips using an endoscopic heavy scissors.

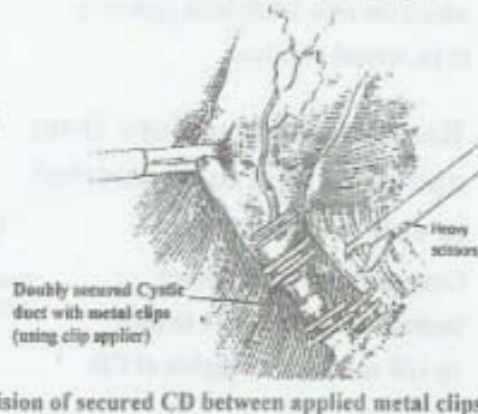


Division of secured CA between applied metal clips

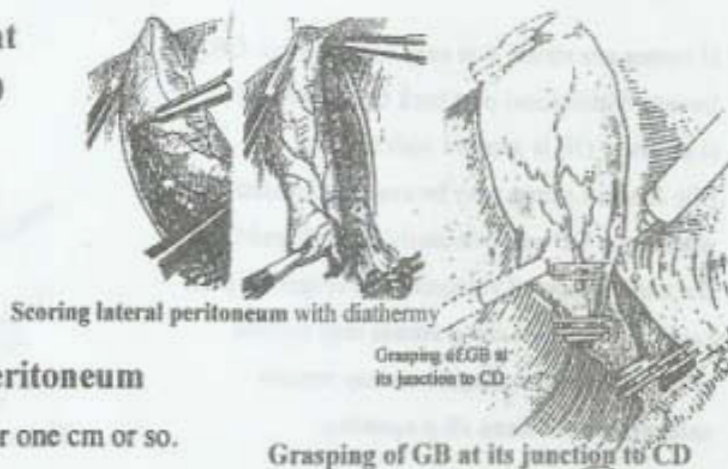
- 14- Doubly securing of CD with metal clips i.e. application of metal clips both proximally & distally using clip applicator as high as possible on CD where it begins to dilate and form GB.



- 15- Division of secured CA between applied metal clips using endoscopic heavy scissors.



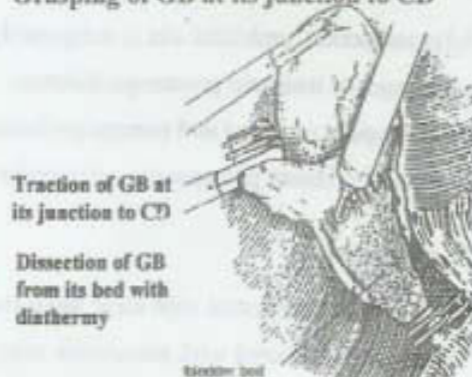
- 16- Grasping of GB at its junction to CD with forceps through middle port to remove GB from its bed in a retrograde manner.



- 17- Scoring lateral peritoneum with diathermy for one cm or so.

- 18- Elevation of GB from liver bed, with appropriate traction & dissection with diathermy...

NB: Vigorous traction or dissection into GB wall may produce an opening with spillage of bile & stones. This opening is secured using forceps, metal clips or a suture loop...



Retrograde removal of GB from its bed

- 19- Haemostasis of GB bed by saline irrigation with aspiration of bile and blood from lateral gutter just over the edge of the liver.**

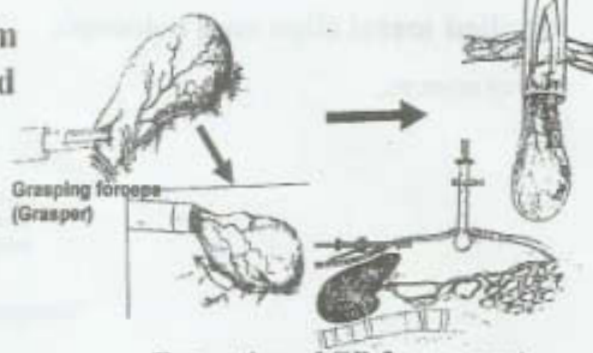


- 20- Division of final peritoneal attachments of GB from liver. GB is positioned above liver, which has now fallen back inferiorly to its normal position.**

Haemostasis of GB bed by saline irrigation

- 21- Removal of videoscope from umbilical port to be inserted in epigastric one.**

Grasping forceps is passed through umbilical port to pick up GB specimen in region of CD.



Extraction of GB from a port

- * If stones are small, it is easy to withdraw GB, forceps & umbilical port back out to level of skin where GB is grasped with a clamp. Bile & small stones may be easily aspirated whereupon GB will exit easily through umbilical site under vision of videoscope in epigastric port.
- * Large or medium-sized stones may require crushing before extraction or may require enlargement of linea alba opening.

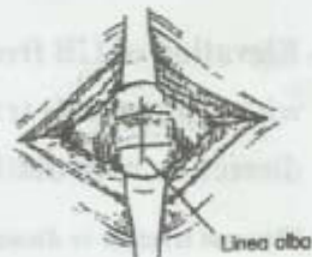


Extraction of GB from a port

After extraction, umbilical site is temporarily occluded with finger to maintain pneumoperitoneum. Videoscope is removed and pneumoperitoneum is evacuated to lessen postoperative discomfort.

23- Closure :

- * Port sites are infiltrated with local anaesthetic.
- * Fascia is re-sutured with absorbable sutures.
- * Skin is approximated with absorbable s.c. sutures.



Closure of linea alba

APPENDICECTOMY

INDICATIONS:

- 1- Acute appendicitis (uncomplicated or complicated with peritonitis) needs **EMERGENCY APPENDICECTOMY**.
 - If complicated with "appendicular mass", it needs **DELAYED APPENDICECTOMY**.
 - 2- Subacute or chronic appendicitis.
 - 3- Appendicular dyspepsia (chronic appendicitis).
 - 4- Mucocele of appendix.
 - 5- Carcinoid of appendix.
- N.B. Carcinoma of appendix needs "right hemicolectomy".

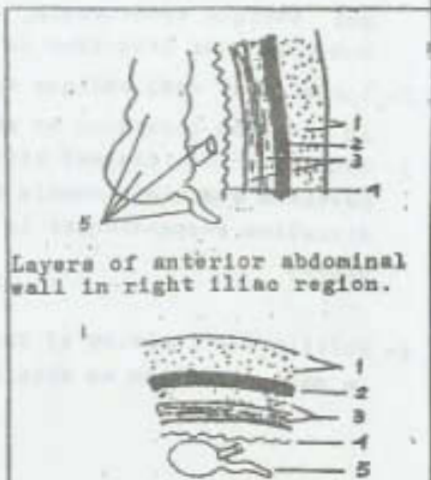
REVISION OF ANATOMY OF RIGHT ILIAC FOSSA:

I During exposure of caecum and appendix, imagine the **LAYERS OF ANTERIOR ABDOMINAL WALL:**

- 1- Skin and S.P.
- 2- External oblique aponeurosis (its fibres run downwards medially):
- 3- Internal oblique and transversus abd. muscles - close to each other (their fibres run perpendicular to those of external oblique).

N.B. Fascia transversalis is adherent to transversus abdominis.

- 4- Peritoneum.
- 5- Caecum and appendix.

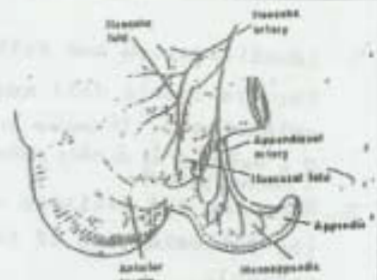


Layers of anterior abdominal wall in right iliac region.

II After exposure of caecum and appendix, imagine the

BLOOD SUPPLY OF APPENDIX:

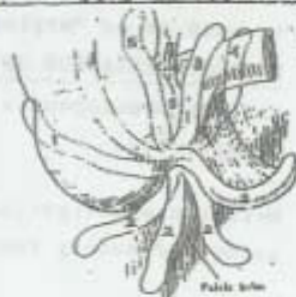
Appendicular A. runs in free border of "mesoappendix". Since this artery can not be dissected, all the mesoappendix must be ligated to devascularize appendix to be excised after that.



Blood supply of appendix.

POSITION OF APPENDIX: (not constant)

1. Commonly **RETROCAECAL**. 70%
2. Less commonly **PELVIC**. 20%
3. Rarely **PREILEAL**.
4. " **POSTILEAL**.
5. " **PARACAECAL**.
6. Occasionally **SUBHEPATIC**.



Suspected positions of appendix.

APPENDICECTOMY (CLASSICAL)

● **ANAESTHESIA:** general or spinal.

● **POSITION:** supine.

● **TECHNIQUE:**

Examine under anaesthesia to detect
APPENDICULAR MASS (if present)!

I EXPOSURE OF CAECUM and APPENDIX:

1- Mc-Burney's Incision = 5 cm. long incision, perpendicular to a line joining anterior superior iliac spine to umbilicus, over a point at the junction of lateral $\frac{1}{2}$ with medial $\frac{1}{2}$ of the line. Incision is deepened to expose external oblique aponeurosis.

McBurney's or Grid-iron is **MUSCLE SPLIT**

2- Incision of ext. oblique aponeurosis in the same direction as skin incision.

3- Separation of internal oblique and transversus abdominis muscle fibers in a direction perpendicular to above incisions.

4- Pulling then incision of the peritoneum, in same direction as skin incision.

5- Identification and delivery of caecum (by its taenia coli and appendices epiploicae). If caecum is fixed (difficult delivery) it is mobilized by dividing peritoneum laterally & inferiorly (Kocherization).

6- Reaching and delivery of the appendix (by following one of taenia coli of caecum).

NB: Lanz incision may be used.

NB: Lower right paramedian incision may be used as an "exploratory incision".

II DEVASCULARIZATION OF APPENDIX:

7- Holding mesoappendix near the tip of appendix.

8- Division and ligation of mesoappendix between 2 artery forceps.



1

(A) Mc-Burney's incision (grid-iron incision)



2

3

Incision of external oblique aponeurosis.

Separation of int. oblique and trans. abdominis muscles.



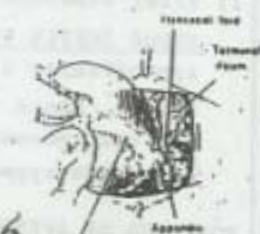
4

Pulling and incision of peritoneum.



5

Identification of the caecum.



6

Delivery of caecum and identification of appendix.



7



8

Holding of appendix. Ligation of mesoappendix.

III EXCISION OF APPENDIX:

- 9- Crushing of base of appendix using a Kocher's forceps; to crush lymphatic tissue in wall of appendix and to avoid slipping of ligature...
- 10- Ligation of crushed base of appendix.
(If inflamed base, no crushing is done)



9



10

Crushing of base of appendix.

Ligation of crushed base of appendix.

- 11- A purse-string seromuscular suture on wall of caecum around base of appendix.



Purse-string suture

11



12



Invagination of stump

13

Purse-string suture around base of caecum.

Division of appendix leaving a stump.

Invagination of stump.

- 12- Division of appendix 2 cm distal to ligature (stump is carbolicised or painted with tincture iodine or alcohol).
- 13- Invagination of stump and tying of the purse-string over it.
(If oedematous caecum, No purse string suture is done).

- 14- Ensure haemostasis and "peritoneal toilet" is done.



14



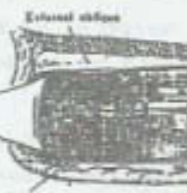
15

Closure of peritoneum.

IV CLOSURE OF WOUND : (in layers)

- 15- Closure of peritoneum.
- 16- Approximation of int. oblique and trans. abdominis.
- 17- Closure of Ext. oblique aponeurosis.
- 18- Closure of skin.

No drain is put (except if there is peritonitis.....).



16



17

Closure of internal oblique and transversus.

Closure of ext. oblique aponeurosis.

Special problems:

- 1- IF oedematous caecum: Stump of appendix is Not invaginated but only ligated & disinfected.
- 2- IF oedematous (infected) base of appendix: it is Not crushed but only ligated.
- 3- IF gangrenous base of appendix: it is Not crushed or ligated, but 2 stitches or more are applied to caecal wall close to it and tied after removal of appendix, then a second seromuscular layer is applied.

18

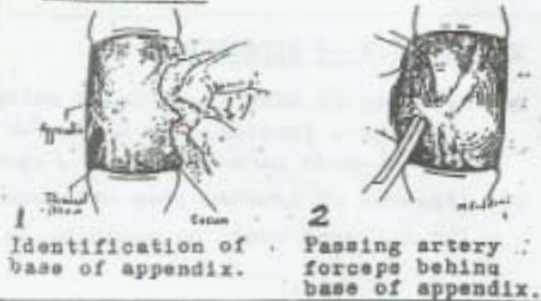
Closure of skin.

RETROGRADE APPENDICECTOMY

It is done when appendix is fixed in its place by adhesions and cannot be delivered into wound. In such cases, "Devascularization and Excision" is done as follows:

- 1 * Base of appendix is identified (its apex is adherent deeply)
- 2 * Artery forceps is passed through meso-appendix near base of appendix.
- 3 * Crushing of base, Ligation and Division (stump is carbolised)
- 4 * A purse-string suture around base, and invagination of stump.
- 5 * Piece-meal division and ligation of the mesoappendix starting proximally to distally...
Then appendix is removed.

Pericolic Adherent Appendix



COMPLICATIONS OF APPENDICECTOMY:

I EARLY:

- 1- Paralytic ileus.
- 2- Faecal fistula (from bursting of the stump) due to *Wrong diagnosis e.g. appendicitis in Cholera etc.*
- 3- Infections: iliac, pelvic or subphrenic abscesses, or Portal pyaemia. *Wrong technique e.g. bad closure of appendix.*

II LATE:

- 1- Adhesive intestinal obstruction (common).
- 2- Incisional hernia (from infection or a large muscle-cutting incision).
- 3- Right direct inguinal hernia (from cutting of ilioinguinal N. in case of low Mc-Burney's incision...).

M.B. Non-specific Complications occurring in any operation may occur:

Shock, Haemorrhage, Infection, Pulmonary complications or D.V.T. (SHIP-D).

SPECIFIC INSTRUMENTS USED IN "APPENDICECTOMY"



NON-TOOTHED APPENDICULAR FORCEPS

SPLENECTOMY

INDICATIONS:

Absolute indications (= must be done):

- 1- Ruptured spleen: commonest indication.
- 2- Wandering spleen= very long pedicle of spleen → mobile spleen.
- 3- Cysts, tumours and abscesses of spleen.
- 4- Certain blood diseases: spheroctosis and thrombocytopenic purpura.
- 5- As a part of radical operations for malignancy e.g. with radical gastrectomy...

Relative indications: (= may be done):

- 1- Egyptian splenomegaly.
- 2- Malaria.
- 3- Other blood diseases: acquired haemolytic jaundice, hyper-splenism, thalassaemia....

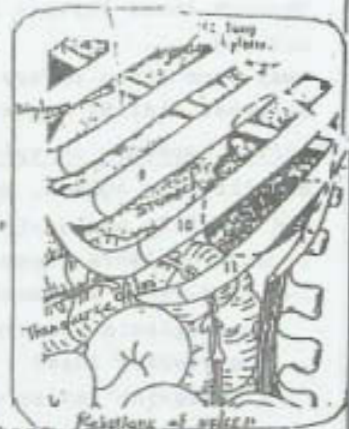
REVISION OF ANATOMY OF SPLEEN:

- Spleen is an oval flattened organ, lies in left hypochondrium behind 9, 10, 11th ribs.
- Its later has 3 surfaces:
 - Lateral surface is related to diaphragm which separates it from 9, 10, 11th ribs, pleura and lung.
 - Inferior surface is related to splenic flexure of colon and phrenicoesplenic ligament.
 - Medial surface (Hilum of spleen through which splenic vessels enter and leave spleen).
- Hilum divides this surface into:
 - anterior part: related to fundus of stomach.
 - posterior part: related to front of left kidney.
 - inferior part: " " tail of pancreas.
- Hilum is the site of attachment of ligaments of spleen, (peritoneal reflections contains through them many blood vessels)

- 1- Gastrosplenic ligament: attaches spleen to greater curvature of stomach (contains short gastric and left gastro-splenic vessels).
- 2- Lienorenal ligament: attaches spleen to front of left kidney (contains splenic artery and vein, and tail of pancreas).

N.B.: splenic A. and V. run along upper border of pancreas (its tail comes in contact hilum. To make them free, tail of pancreas must be stripped away).

Note that to mobilize the spleen, these ligaments must be ligated and divided between clamps—but note that splenic vessels are ligated and divided separately.



NB. Also, spleno-colic ligament attaches spleen to a splenic flexure of colon, but phrenico-colic ligaments runs lateral and in front of spleen.

NB: Accessory spleens (spleniculi) may be present in little cases related to hilum, ligaments or vessels. They must be removed (if present) especially in cases of hypersplenism, because : they may hypertrophy with recurrence of symptoms before splenectomy.

I DURING EXPOSURE OF spleen, imagine layers of anterior abdominal wall in region of left hypochondrium. Exposure may be done either:

- . Through these layers: left subcostal incision (see before).
- . Away from these layers: left upper paramedian incision or upper midline incision (see before)....

II After exposure of spleen, to excise it:

- . Mobilize the spleen, by imagining its attachments and ligating and dividing them:
 - 1- Gastrosplenic ligament .
 - 2- Lieno-renal ligament: has 2 layers (between which runs splenic vessels):
 - . anterior layer : exposed anteriorly.
 - . posterior layer: exposed from posterior aspect of spleen.
 - 3- Spleno-colic ligament.
- . Devascularize the spleen, by ligation of its blood supply which is splenic vessels that run inbetween:
 - Gastrosplenic lig. and anterior layer of lienorenal lig. anteriorly.
 - Post. layer of lienorenal lig. posteriorly.

SPLENECTOMY

● **ANAESTHESIA:** General ; endotracheal.

● **POSITION:** Supine.

● **TECHNIQUE:**

I-EXPOSURE OF SPLEEN:

1- Incisions: one of 3 incisions:

* Left subcostal incision: in heavily built patients.

* Left upper paramedian incision : in thinly-built patients.

Also used in trauma or staging (adequate exposure).

* Midline incision: in hemolytic jaundice (to do cholecystectomy if needed).

2- Layers of abdominal wall are incised (as before) to expose abdominal viscera: colon is packed out downwards, stomach is retracted medially and rib margin is retracted laterally to expose spleen in the field.

II- MOBILIZATION OF SPLEEN:

3- Incision of avascular area in gastrosplenic ligament to expose splenic A. (along upper margin of pancreas) to doubly ligate it but not yet divided, this is done:

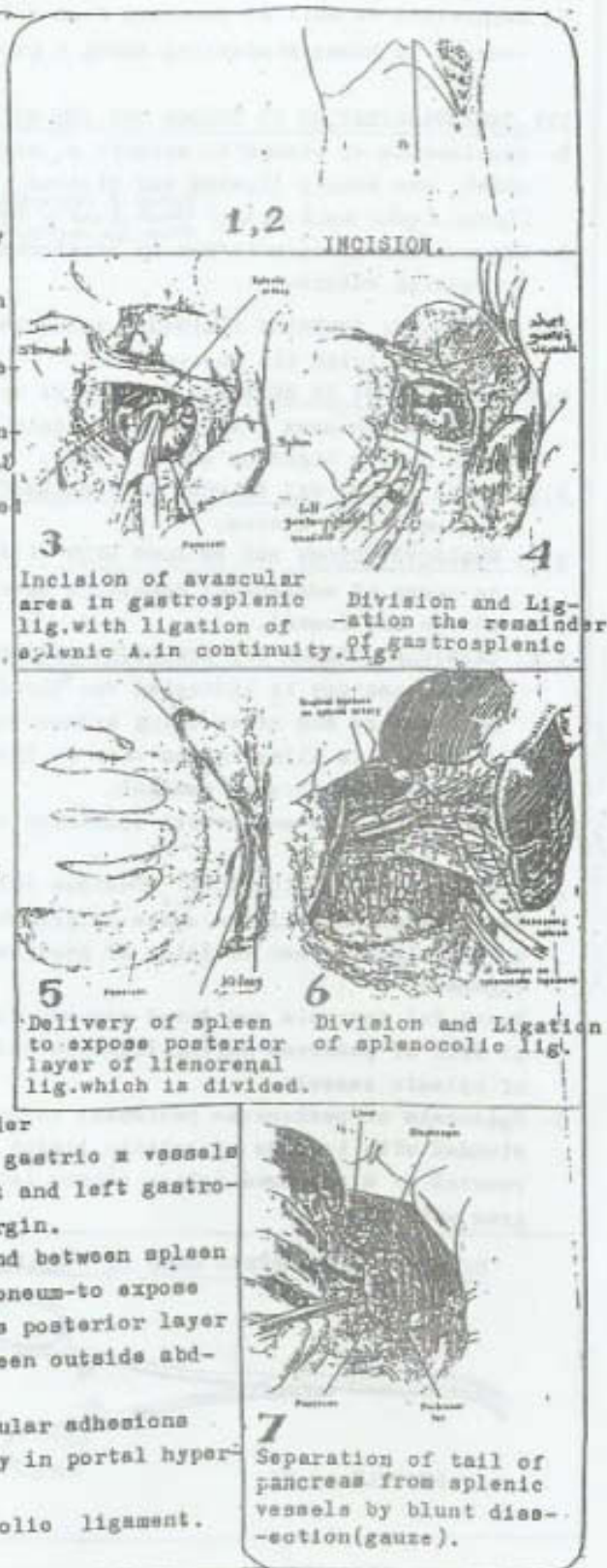
- . to allow autotransfusion from spleen to general circulation through splenic v. → shrinkage of spleen → easy removal.
- . to make mobilization safer and easier.

4- Division and ligation the remainder of gastrosplenic ligament. Short gastric vessels are encountered at its upper part and left gastroepiploic vessels at its lower margin.

5- Delivery of spleen by passing hand between spleen and diaphragm and parietal peritoneum-to expose lienorenal ligament to divide its posterior layer (usually avascular) to bring spleen outside abdomen.

NB: Dense adhesions and slender vascular adhesions are ligated and divided (especially in portal hypertension).

6- Division and ligation of splenocolic ligament.



7. Separation of tail of pancreas from splenic vessels by blunt dissection using a gauze.

III. DEVASULARIZATION OF SPLEEN AND ITS EXCISION:

- 8- Application of clamps to splenic A. and splenic V. which are doubly ligated and divided. Then, removed.
Ligation of splenic vessels may be \leftarrow Splenic A. then splenic V. separately (Mass ligation) or Splenic branches & transverse colon & spleen.
- 9- Haemostasis of splenic bed by ligatures and under running sutures.

IV. CLOSURE: (WITHOUT DRAINAGE) according to types of of incision (in layers)....

N.B. SPLENECTOMY IN RUPTURED SPLEEN: is an "emergency" which needs "mass clamping" of splenic pedicle with double ligation and division.

N.B. LIVER BIOPSY MAY BE DONE WITH SPLENECTOMY to evaluate R.E. system.

N.B. CHOLECYSTECTOMY MAY BE DONE WITH SPLENECTOMY in cases of congenital hemolytic anemia (if gall stones are found).

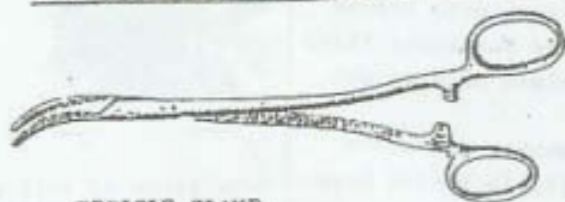
N.B. CAREFULLY SEARCH FOR ACCESSORY SPLEENS (SPLENICULI) if splenectomy is indicated for "blood dyscrasias" both before and after doing splenectomy: Commonest site is hilar region then in lieno-renal ligament and greater omentum.

N.B. RYLE'S TUBE is put before operation and left for days after it.

POST-OPERATIVE COMPLICATIONS: (besides SHIPD)

- 1- Haematemesis due to inclusion of gastric wall during ligation and division of gastrosplenic ligament.
- 2- Local fat necrosis and Burst abdomen due to injury of tail of pancreas during ligation and division of splenic vessels.
- 3- "Splenosis" of peritoneum- peritoneal surface become studded with islands of splenic tissue during removal of a ruptured spleen (these islands will grow with time).

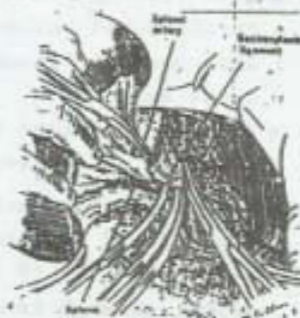
SPECIFIC INSTRUMENTS USED IN " SPLENECTOMY "



PEDICLE CLAMP

8

Application of clamps to splenic vessels which are doubly ligated and divided.



Mass clamping of splenic vessels in cases of ruptured spleen.....



Field after splenectomy.....

REPAIR OF INGUINAL HERNIAS

3 TYPES OF OPERATIONS:

- Herniotomy = excision of the sac.
- Hemiorrhaphy = repair of the defect (in post wall of inguinal canal).
- Hernioplasty = putting a graft over the defect (" " " ").

REVISION OF ANATOMY OF INGUINAL CANAL AND REGION:

I To expose hernial sac, imagine layers of anterior abdominal wall at the inguinal region (anterior wall of inguinal canal):

- 1- Skin and S.F.
- 2- External oblique aponeurosis.

II Hernial sac in indirect inguinal hernia is one of contents of spermatic cord so, to expose it, imagine the coverings of spermatic cord in inguinal canal to incise them:

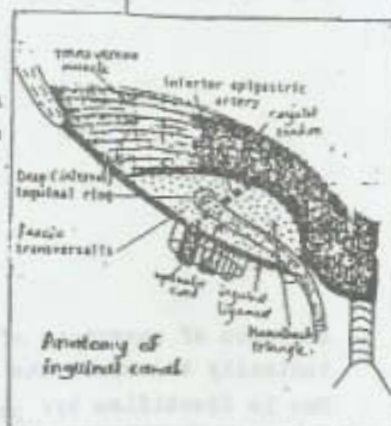
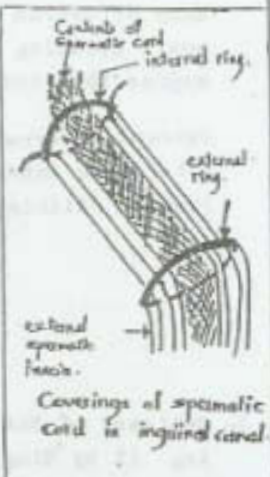
- 1- Cremasteric muscle-fascia (outside).
- 2- Internal spermatic fascia (inside).

Then, the sac must be separated gently from other contents of cord. Hernial sac in direct inguinal hernia is not related to spermatic cord, but it is only a defect in Hasselbach's triangle. So, to expose it, imagine the posterior wall of inguinal canal which is nothing but a layer of fascia transversalis covering the sac.

After exposure of sac, Herniotomy is done.

III After herniotomy, Repair the defect (from which the sac protrudes) in posterior wall of inguinal canal which is "fascia transversalis":

- Defect in indirect inguinal hernia is the wide "deep ring" while defect in direct inguinal hernia is the weak area of "Hasselbach's triangle" in the fascia transversalis. In the former, fascia transversalis is plicated around deep ring and in the latter, fascia transversalis is plicated in the Hasselbach's triangle ...which is the essential part of repair.
- Weak abdominal muscles are compensated for by a "REPAIR" e.g. obliteration of inguinal canal itself by approximation of its roof (conjunct tendon) to its floor (inguinal ligament) = HASSINI'S REPAIR. both indirect and direct hernias... = HEMIORRHAPHY. However, skin, synthetic tents or fascia lata may be used to close the defect = HERNIOPLASTY.



REPAIR OF INDIRECT INGUINAL HERNIA

● **ANAESTHESIA:** general or spinal or local.

● **POSITION:** supine.

● **TECHNIQUE:**

I EXPOSURE OF SAC:

1- Inguinal incision: one finger-breadth above and parallel to medial 2/3 of inguinal ligament. Incision is deepened to expose ext. oblique aponeurosis.

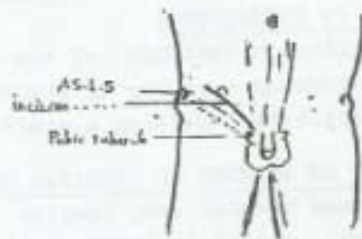
2- Incision in ext. obl. aponeurosis in the same direction and length as skin incision, until slitting the superficial ring- to expose the cord.

Retract external oblique aponeurosis to outside to expose "inguinal canal".....
Protect "ilioinguinal nerve".....

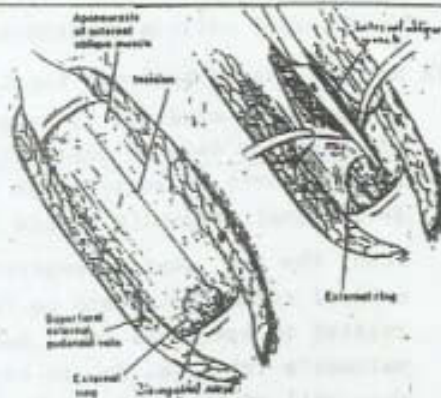
3- Delivery of the cord by fingers and hanging it by Ring forceps or gauze.

4- Incision of coverings of the cord longitudinally to expose the sac (2 layers).
Sac is identified by: pearly white colour, definite edges, crescentic fundus and by lying anterolateral to vas and vessels.

5- Dissection of sac up to its neck. Neck is identified by: being narrowest part, surrounded by dense extraperitoneal fat and being immediately lateral to inferior epigastric vessels.

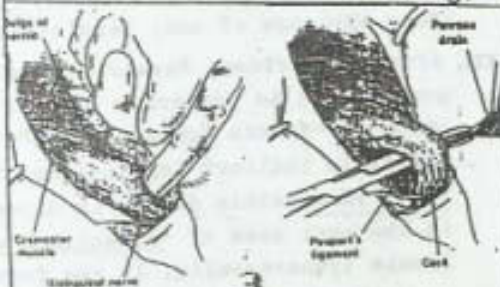


1 Incision



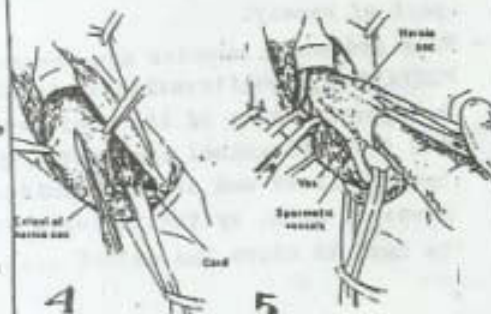
2

Incision of external oblique aponeurosis till the external ring.



3

Delivery of cord. Elevation of cord



4

5

Opening of coverings of cord.

Dissection of the sac.

II HERNIOTOMY:

- 6- Opening sac at its fundus and explore its contents: it may be adherent intestine (separated and returned to abdomen) or adherent omentum (excised) or sliding hernia may be present.....
- 7- Transfixion ligation of neck of sac, followed by excision leaving 1 cm stump. (Transfixion must be done under vision).

III HERNIORRHAPHY:

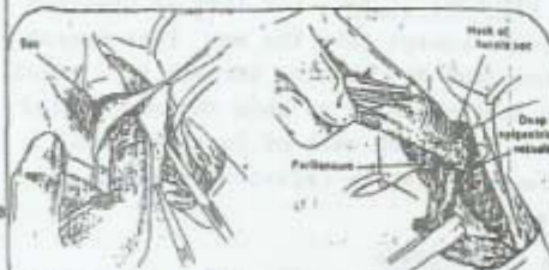
- 8- Plication of fascia transversalis - Narrowing deep ring so that its size allow tip of little finger beside the cord & tightening of whole length of fascia transversalis (using non-absorbable sutures).
Then, REPAIR POST. WALL OF INGUINAL CANAL
- 9- BASSINI'S REPAIR- Suturing conjoint tendon to inguinal ligament behind the cord (using nonabsorbable sutures).
- NB: Other methods of repair may be used instead (See text.....).

IV CLOSURE OF WOUND:

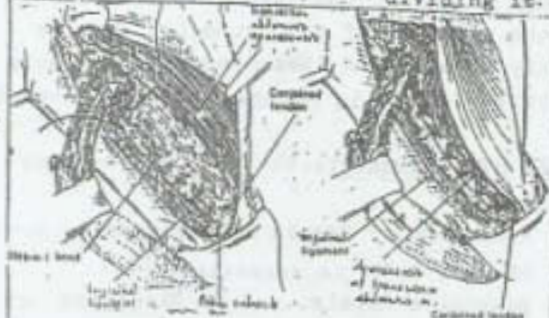
10. Return cord to its place and close its coverings (Re-skeletonization).
11. Close external oblique aponeurosis until superficial ring which must be narrowed so that its size allows tip of little finger beside the cord.
12. Close S.F. and skin.

OPERATION FOR CONGENITAL INGUINAL HERNIA:

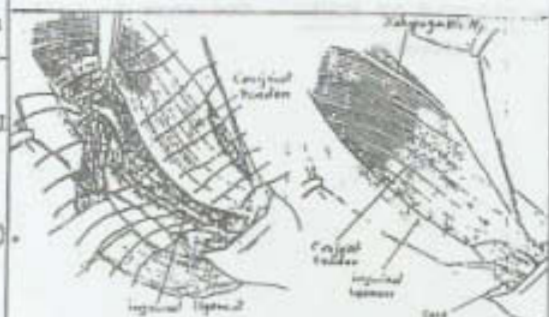
- INCISION: in lower abd. crease (transverse).
- Ext. obl. aponeurosis is NOT OPENED, but cord is exposed directly by incision and sac is dissected and excised. This is because the ext. & int. inguinal rings lies opposite each other and inguinal canal is undeveloped.



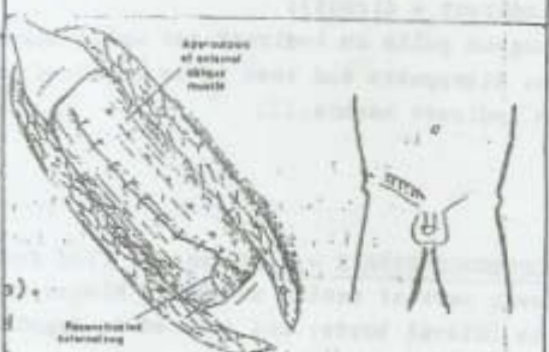
Opening sac at its fundus and exploration transfixion of sac at its neck and dividing it.



Plication of fascia transversalis.



BASSINI'S REPAIR. suturing inguinal lig. to conjoint tendon.



Closure of external oblique aponeurosis.

Closure of skin

REPAIR OF DIRECT INGUINAL HERNIA

I EXPOSURE OF SAC: the same as indirect hernia except that the sac lies behind cord (and not passing through it). Cord is just elevated to show the sac behind the posterior wall of inguinal canal = always medial to inferior epigastric vessels.

II HERNIOTOMY:

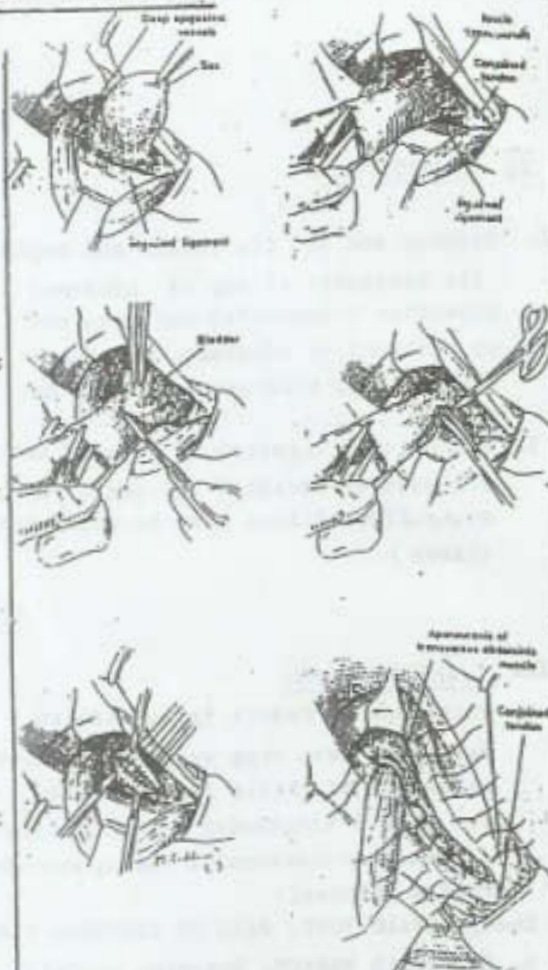
Neck of sac is usually wide so that transection is impossible. If sac is large, it may be opened and then closed by continuous sutures. If sac is small, sac is only invaginated (not opened) and fascia transversalis is repaired (plicated) over it.

III HERNIOERHAPHY: the same as indirect hernia:

- Plication of fascia transversalis over the sac only is essential.
- Bassini's Repair.... (or Bloodgood or Halsted's Repair).

NB: Hernioplasty may be done.

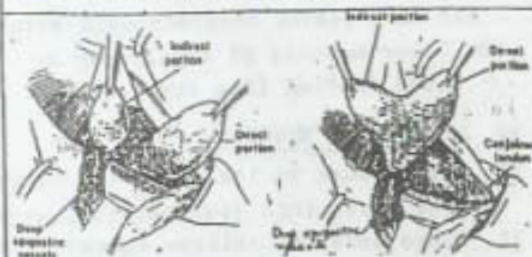
IV CLOSURE OF WOUND: the same as indirect hernia.



REPAIR OF DIRECT INGUINAL HERNIA.

REPAIR OF PANTALOON HERNIA (DOUBLE HERNIA) (indirect + direct):

Surgeon pulls on indirect sac until direct sac disappears and then it is repaired as an indirect hernia....



REPAIR OF PANTALOON HERNIA.

BLOODGOOD REPAIR = a triangular flap from lower part of rectus sheath is hinged on its lateral border and sutured to inguinal ligament behind cord.



BLOODGOOD REPAIR.

HALSTED'S REPAIR = the same as MASSINI'S REPAIR but the external oblique aponeurosis is closed behind cord so that the cord becomes subcutaneous.

HERNIOPLASTY: (Best is skin graft)

I AUTOGRAFTS: Darning by strips of fascia lata or ext.obl. aponeurosis.
Patching by patch of fascia lata or skin graft.

II ARTIFICIAL GRAFTS:

- Darning by thick threads of silk, nylon, stainless steel,
- As a mesh by proline, tantalum or dacron meshes,

VARIATIONS IN TECHNIQUE IN STRANGULATED INDIRECT INGUINAL HERNIA:

- 1- Incision is inguino-scrotal → good exposure.
- 2- Incision of ext. obl. aponeurosis is without opening of superficial ring (= may be the strangulating factor).
- 3- On opening fundus of sac, fluid content is sucked out (= clearing contents of sac).
- 4- Constricting ring is divided cautiously (= to protect strangulated intestine).
- 5- Determine viability of intestine:
 - * viable intestine is returned back.
 - * but non-viable intestine (gangrenous) is resected with anastomosis (see text....).
- 6- Repair may or may not be done (= oedematous tissue....)
- 7- Drainage of wound on closure is essential because tissue are contaminated or when resection-anastomosis is done.



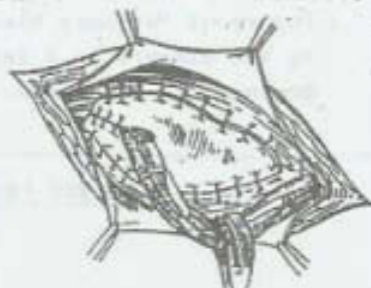
HALSTED REPAIR.



DARNING USING FASCIA LATA....



PREPARATION OF SKIN GRAFT....



HERNIOPLASTY WITH SKIN GRAFT.



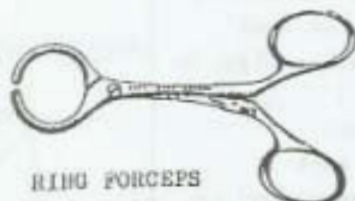
Inguino-scrotal incision in cases of strangulated hernia.



POST-OPERATIVE COMPLICATIONS OF REPAIR OF INGUINAL HERNIAS:

- 1- Haematoma (due to imperfect haemostasis)
ttt: open the wound to evacuate haematoma.
- 2- INFECTION (due to haematoma or seroma, rough handling of tissues).
ttt: open wound to drain pus.
- 3- Hydrocele (due to tight deep or superficial rings around cord).
ttt: Early cases: scrotal elevation+ pressure bandage.
Established cases: Eversion of tunica or Lord's operation.
- 4- RECURRENCE:
Causes:
 - Preoperative: Huge hernia, untreated cause of high I.A.P. or weak muscles.
 - Operative: Missed rules of hernial surgery, or insufficient repair....
 - Postoperative: haematoma, infection, distension or rapid return to work.ttt: Herniorrhaphy and Hernioplasty depending on age, occupation, size of hernia, condition of muscles... ..
- 5- INJURY OF IMPORTANT STRUCTURES DURING DISSECTION OF SAC :
 - Injury of cord structures or their compression at int. or ext. ring, which may cause :
 - Testicular atrophy.
 - Hydrocele.
 - Painful mass of thrombosed pampiniform plexus of veins.
 - Injury of "urinary bladder" if sliding in a hernia. This is dealt with by its closure in 2 layers + its drainage by a "catheter" for 4-5 days + drainage of the wound.

SPECIFIC INSTRUMENTS USED IN "HERNIAL REPAIR"



RING FORCEPS
(All Ibrahim Basha Forceps)

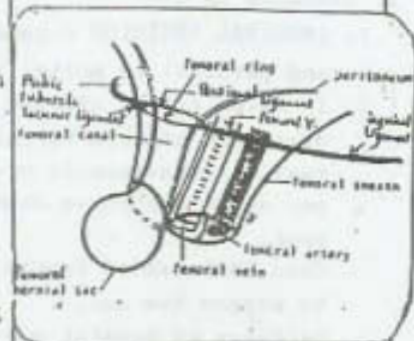
REPAIR OF FEMORAL HERNIA

TYPES OF OPERATIONS:

- 1- HERNIOTOMY: as before = excision of hernial sac.
- 2- HERNIORRHAPHY, Obliteration of femoral ring (Site of protrusion of sac). Usually, both operations are done together.

REVISION OF ANATOMY OF FEMORAL CANAL and RING:

- Femoral canal is the medial and shortest compartment of femoral sheath. Like an "inverted cone".
Femoral sheath lies below the inguinal ligament.
- Femoral ring is the upper end of femoral canal which is bounded by:
 - Laterally: femoral V.
 - Medially: lacunar ligament. (Abnormal obturator A. runs on its free border in 25% of people).
 - Anteriorly: Inguinal lig. (= Poupart's lig).
 - Posteriorly: pectineal lig. (= Cooper's lig).
- Hernial sac comes out through femoral ring passing downwards through femoral canal and may protrude through saphenous opening.



I To expose hernial sac through inguinal approach, imagine layers of anterior abdominal wall covering the sac:

- Skin and S.P.
- Ext. Oblique: aponeurosis (the roof of inguinal canal).
- Fascia transversalis. (the floor of the inguinal canal and at the same time, it is the roof of femoral canal).

After incision of Fascia transversalis, (which is the floor of inguinal canal and is anterior wall (roof) of femoral canal) the sac is seen protruding the femoral canal with its neck at femoral ring. Then, herniotomy can be done.

II. After herniotomy, the hernial defect (femoral ring) is repaired, by its obliteration. Obliteration of femoral ring is done by suturing its boundaries to each other i.e. by suturing of pectineal lig. to inguinal lig.

NB: Hernial sac can be exposed by "femoral approach"

i.e. by incision of layers at level below inguinal ligament covering the sac which are:

- skin and S.P.
- D.P.

to expose saphenous opening (an opening in D.P. of thigh) and to follow the sac through femoral canal to femoral ring - where it can be dealt with!

REPAIR OF FEMORAL HERNIA

INGUINAL APPROACH (LOTHEISEN'S OPERATION)

= Suproligamentous operation-through inguinal canal (commonly used):

- **ANAESTHESIA:** general, spinal or local.
- **POSITION:** supine.
- **TECHNIQUE:**

I EXPOSURE OF SAC:

- 1- **INGUINAL INCISION** = immediately above and parallel to medial $\frac{1}{2}$ inguinal lig.
- 2- Incision of ext oblique aponeurosis in direction of skin incision to expose fascia transversalis covering hernial sac which protrudes down into femoral ring.
Then, incision of fascia transversalis to expose the sac.
- 3- Delivery of hernial sac by pulling its neck upwards and pushing fundus from below. Thus sac is delivered out from femoral canal.

II HERNIOTOMY:

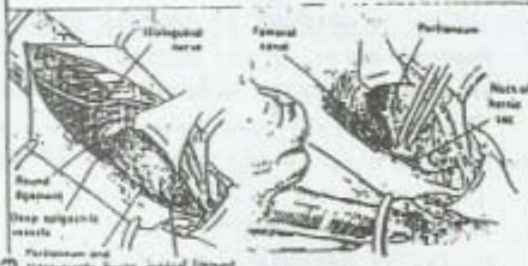
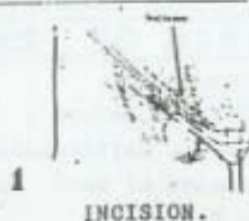
- 4-Opening of fundus of sac and reduction of its contents.
- 5-Transfixion. Ligation of neck of sac "flush" with peritoneum, and then excision leaving one cm stump.

III HERNIORRHAPHY:

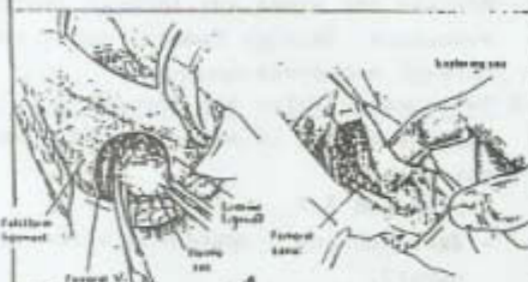
- 6-Suture the incision in fascia transvers.
- 7-Suture conjoint tendon to pectineal lig. and to free margin of inguinal ligament by the same stitches (P to C to P repair). This repair closes "femoral ring" and strengthens the posterior wall of inguinal canal.

IV CLOSURE: (in layers)

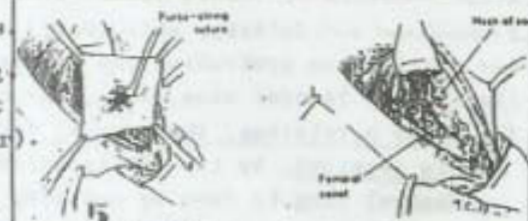
- 8- After returning spermatic cord (or round lig) to its place, close external obl. aponeurosis leaving a comfortable external ring.
- 9- Closure of S.F. and Skin



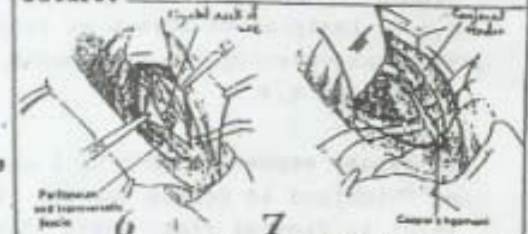
Incision of ext. obl. aponeurosis with retraction of cord. (After incision of fascia transversalis) Starting delivery of sac.....



3 Dissection for delivery of sac. 4 Opening fundus of sac and examination of its contents.



5 Transfixion of neck of sac by a purse-string suture. 6 Suturing fascia transversalis.



7 Repairing by suturing the conjoint tendon to the pectineal lig. to the inguinal lig.

FEMORAL APPROACH (LOCK-WOOD OPERATION)

- Infraligamentous operation - in the thigh (not used).

I EXPOSURE:

- INCISION: $\frac{1}{2}$ inch below and parallel to middle $\frac{1}{3}$ of inguinal lig.
- Dissection of coverings and following the sac through saphenous opening and femoral canal to the femoral ring to deliver it.

II HERNIOTOMY:

Opening of Sac and reduction of its contents, contents,

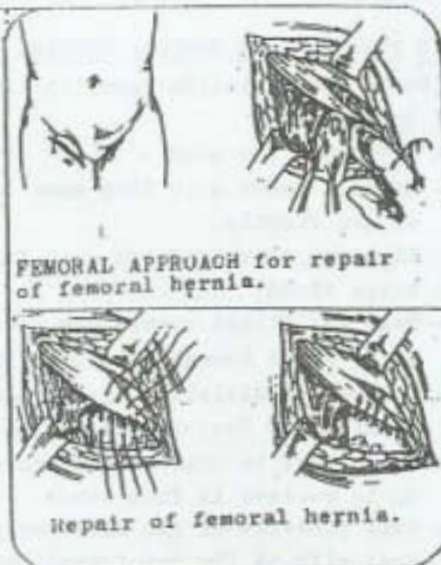
- Transfixion ligation of its leaving one cm stump.

III HERNIORRAPHY. :

- Obliteration of femoral ring by suturing inguinal lig. to pectineal lig. i.e. suturing its anterior to posterior boundaries.

ADVANTAGES OF INGUINAL APPROACH:

- 1- Proper transfixion of sac at its neck flush with peritoneum is UNDER VISION .
- 2- Better closure of femoral ring is from above.
- 3- Dealing with abnormal obturator A is UNDER VISION.
- 4- It is the only approach to deal with Strangulated femoral Hernia because:
 - intestine is dealt with only from above
 - easy dealing with abnormal obturator A.



IN STRANGULATED FEMORAL HERNIA:

(Usual strangulating agent is LACUNAR LIGAMENT)

I EXPOSURE:

- INCISION: the same .
- Dissect lower skin flap down to expose fundus of sac firstly.
- Dissect coverings and open fundus to evacuate toxic fluid.
- Pass the finger within sac to feel the constricting agent (usually lacunar ligament).
- Cut the constricting agent (but before cutting, examine its free border for abnormal obturator A. which must be ligated) and then , push the sac up to relieve it from above.
- Pull contents of sac out freely to examine and deal with it (Do not forget the possibility of Mayde's hernia).

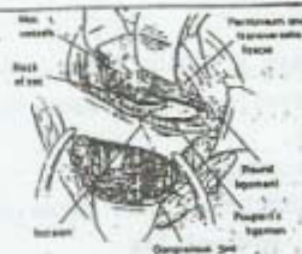
If gangrenous intestine, do resection anastomosis (if this is done, put a DRAIN in peritoneum near anastomosis and bring it out through a separate stab in flank or suprapubically).

II, III HERNIOTOMY and HERNIORRHAPHY: the same

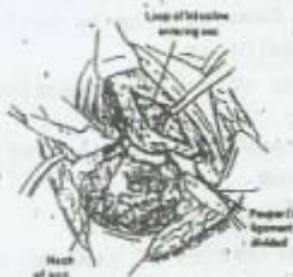
IV CLOSURE: the same, but with DRAINAGE (as above)

NB: PREOPERATIVE Ryle's tube with suction + I.V. fluids are essential.

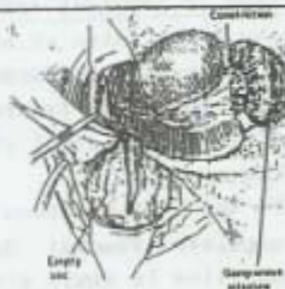
NB: POSTOPERATIVE Ryle's tube suction + I.V. fluids are continued untill intestinal sounds are heard + Antibiotics.. Remove drain when stop discharging...



Dissection around neck of sac.



Opening of fundus of sac.



Excision of constricting ring (usually lacunar lig.)

REPAIR OF PARAUMBILICAL HERNIA

To repair paraumbilical hernia, sac is transfixed and excised (Herniotomy), then the defect is repaired (Herniorrhaphy). When defect is large, repair is performed by a strong sheet e.g. synthetic material (Hernioplasty).

REVISION OF ANATOMY OF PARAUMBILICAL REGION:

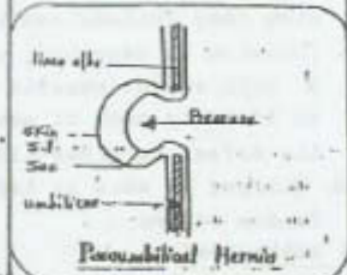
I To expose paraumbilical hernial sac, imagine layers of anterior abdominal wall covering it:

Skin and S.F. only.

Sac is seen protruded through a defect in the wide linea alba usually above umbilicus. Herniotomy is done.

II After Herniotomy, defect in linea alba is repaired (Herniorrhaphy) by overlapping upper flap of linea alba over lower flap (MAYO'S REPAIR).

NB: Repair of epigastric hernia is the same but if PHL NO sac; but only extraperitoneal fat is present which is easily ligated and divided followed by the same herniorrhaphy as before.



REPAIR OF PARAUMBILICAL HERNIA

• **ANESTHESIA:** general, spinal, or local.

• **POSITION:** supine.

• **TECHNIQUE:**

I EXPOSURE OF SAC:

- 1- **INCISION:** Transverse Elliptical incision (may include umbilicus)
- 2- Incision is deepened, until linea alba & both rectus sheaths are exposed to identify neck of sac and to see the defect in linea alba.

NB: Ellipse of skin is left attached to fundus of sac.

II HERNIOTOMY:

- 3- Incision at neck of sac all around (not at fundus to avoid adhesions between it and intestines and omentum and then remove the whole mass of skin, fat and adherent sac. If there is adherent omentum, it is excised.

III HERNIORRHAPHY:

- 4- Widening the defect in linea alba, on either sides until rectus muscles are seen.
- 5- Having peritoneum and linea alba as one flap-superiorly and inferiorly - to do MAYO'S REPAIR.
- 6- **MAYO'S REPAIR:** Overlapping of flaps of linea alba (and peritoneum) transversely upper over lower - by suturing lower flap beneath upper one then, suturing of free margin of upper flap to anterior surface of lower one.

IV CLOSURE:

- 7- Closure of skin with drainage through a separate stab centrally below skin incision.

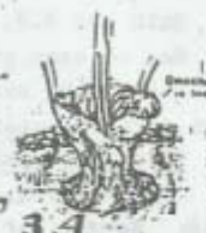
NB: If umbilicus is removed, a nice "new umbilicus" can be done by a plastic surgeon.



1 INCISION



2,3 Dissection of neck to see defect in linea alba.... Opening sac at its neck.



3,4 Examination of contents of sac and extension of defect...



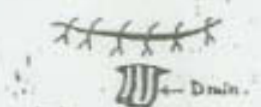
5 Holding peritoneum and linea alba as one flap.....



6 MAYO'S REPAIR - overlapping of linea alba transversely at site of defect.



6 suturing free margin of upper flap to the anterior surface of lower flap.



7 Closure of skin with drainage through a separate stab below.

IN STRANGULATED P.U.H:

- Pre-operative preparation by Ryle's tube suction+ I.V. fluids.

- Technique:

- EXPOSURE :: is the same

- HERNOTOMY: Sac is incised at fundus (not at neck)

Evacuate toxic fluid and pass a finger inside sac to feel the constricting ring (usually the narrow defect in linea alba)

Widen this narrow defect laterally in linea alba and dissect any adhesion to examine contents and deal with them. If gangrenous intestine, do Resection-anastomosis (in this case, put a drain having an exit in a separate stab in flank or suprapubic region).

- HERNIORRHAPHY(MAYO'S REPAIR): is the same.

- Closure: the same but with peritoneal drainage by a separate stab in flank or suprapubically .

- Postoperative management: the same as femoral hernia.

INFANTILE UMBILICAL HERNIA:

- INCISION: Semicircular below umbilicus.

- Dissect the skin flap upwards. usually, fundus of sac is adherent to back of umbilicus.

- clear the neck of sac and define the defect in linea alba.

- Transfixion ligation at neck and its division

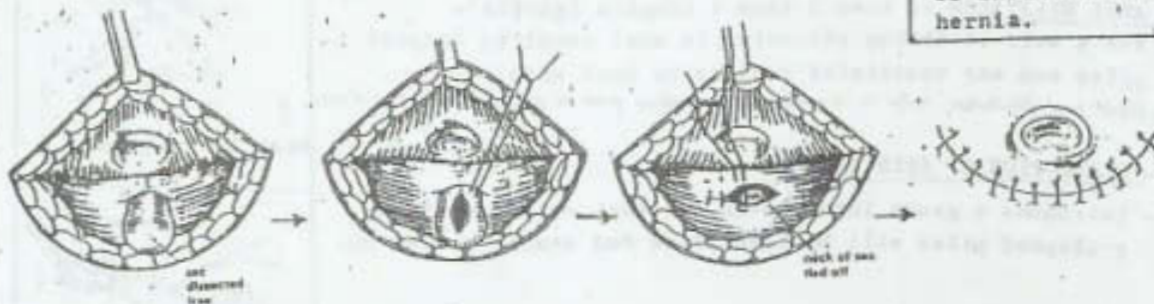
Do not remove fundus as it is adherent to back of umbilicus.

- close defect in linea alba.

- close skin with drainage (below incision).



INCISION in case of infantile umb. hernia.



EPIGASTRIC HERNIA : 2 types

1- TRUE EPIGASTRIC HERNIA: MAYO'S REPAIR.

2- PATTY HERNIA OF LINEA ALBA (PALA): No true sac.

- INCISION: transverse to expose the lump (only extra peritoneal fat).

- Dissect the lump to clear its pedicle and define the defect in linea alba.

- Transfixion ligation of pedicle and excision of lump.

- Close defect in linea alba .

- Close skin with (or without) drainage.

N.B: If multiple FHIA, a long vertical incision is used to expose them.

HAEMORROIDECTOMY (PILECTOMY)

INDICATIONS :

- 1- Third and fourth degrees piles.
- 2- Early degrees not cured by injection.
- 3- Fibrosed piles.
- 4- If associated with external piles.

REVISION OF ANATOMY OF "INTERNAL PILES" :

- Internal piles are varicosities of tributaries of superior rectal vein and are covered by mucous membrane. These tributaries lie in anal canal at 3, 7, 11 o'clock positions when patient lies in a lithotomy position. Many daughter piles may be present.
- Thus, anatomically a "haemorrhoid" is a fold of mucous membrane and submucosa containing a varicose tributary of superior rectal vein and a terminal branch of superior rectal artery - lying superficial to longitudinal muscle layer of anal sphincter.

HAEMORROIDECTOMY

ANAESTHESIA : spinal (of choice), general, or local.

POSITION : LITHOTOMY - with buttocks projecting beyond the edge of table.

TECHNIQUE :

I- ANAL DILATATION : 2 then 3 then 4 fingers (gently).

Put a self-retaining retractor in anal canal to inspect piles and any associated lesions to deal with.....

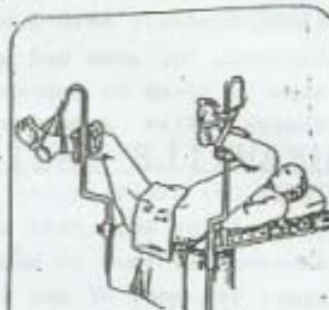
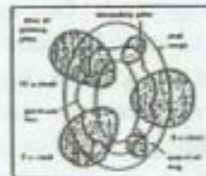
NB: Wide anal dilatation helps to avoid postoperative pain or spasm & retention of urine.

II- DISSECTION OF PILE PEDICLE :

- 2- Introduce a gauze into rectum and then withdraw it → prolapsed piles will be identified and easily picked up.

- 3- Apply traction with ALLIS forceps on the related skin tags to prolapse the piles. Then, catch it with ARTERY forceps.

NB: Normally, the perianal skin is "taggy" in 3rd and 4th degrees piles.



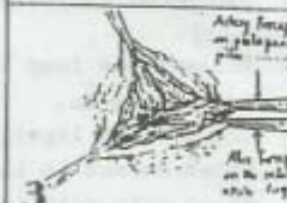
Lithotomy position



1
Anal Dilatation.....

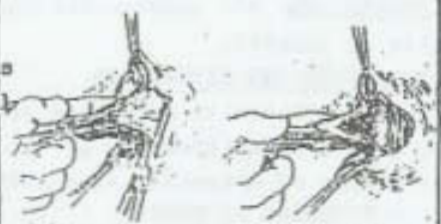


2
Introduction and withdrawal of a gauze to anal canal.



3
Traction of skin tags to prolapse the piles to catch them with artery forceps.....

- 4- V-shaped incision is done at mucocutaneous junction at 3 o'clock with its apex outwards. This V-shaped flap is elevated from subcutaneous sphincter. Piles is dissected until longitudinal fibers of anal intermuscular septum is exposed. 2 snips are done on either side of the haemorrhoid, which is then dissected from anal sphincter until its pedicle is exposed.



V-shaped incision Dissection of to mucocutaneous piles until junction..... exposure of longitudinal fibres.....

4

III- TRANSFIXION-LIGATION OF PILE PEDICLE :

- 5- Exposed pedicle is doubly ligated by transfixion, and then divided 1 cm below the ligature.
- 6- Haemostasis is done.



Transfixion-Ligation Division of of pedicle of piles. pedicle of piles leaving a stump 1cm.

5

All above steps are repeated for 7 o'clock and then for 11 o'clock haemorrhoids.

IV. DRESSING OF SITE OF OPERATION:

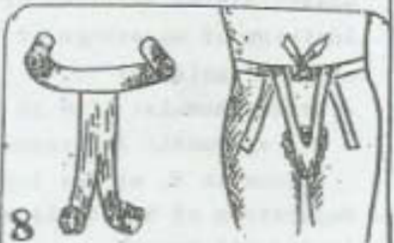
- 7- At the end of operation, skin wounds are carefully inspected and trimmed, so that no tags in anal margin will be present. Ligated stumps are returned to rectum and 3 pieces of gauze soaked in flavine (antiseptic) and tannic acid (astringent) are applied for the 3 sites of piles - with a 1/2 inch wide rubber tube inbetween (inserted into anus to allow passage of flatus and give warning of bleeding). These are left for 24 hours (to ensure complete haemostasis).



Resulting row areas at end of operation. Dressing of site of operation... with 3 gauzes..

7

- 8- A cotton-wool dressing is applied and secured with T-bandage.



Application of a bandage.

8

● POSTOPERATIVE CARE;

- Remove dressings on first morning after operation.
- After every motion, anal region is irrigated with warm Dettol solution.
- Anal dilatation with index finger on alternate days until wound healing.

● POSTOPERATIVE COMPLICATIONS;

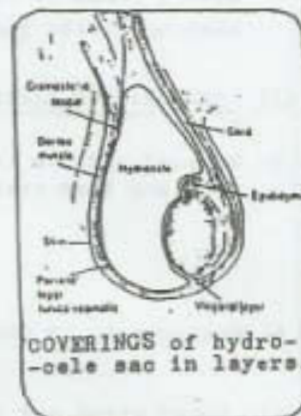
- 1- Retention of urine (ttt: Carbachol - If fails, Catheterize the patient).
- 2- Haemorrhage (reactionary or secondary).
- 3- Anal stricture.
- 4- Recurrence = enlarged "daughter piles".....

REPAIR OF HYDROCELE

INDICATIONS: all symptomatic hydroceles (by their size or weight).

OPERATIONS FOR HYDROCELES:

- 1- Aspiration with injection of a sclerosing solution : unsatisfactory .
- 2- Repair of hydrocele sac: either by:
 - EVERSION OF TUNICA.
 - LORD'S OPERATION (PLICATION OF TUNICA).
 - SUBTOTAL EXCISION OF TUNICA: in large or thick walled or calcified hydroceles. Also, in hematocele, chylocele, pyocele and recurrent cases .



REVISION OF ANATOMY OF SCROTUM AND ITS CONTENTS:

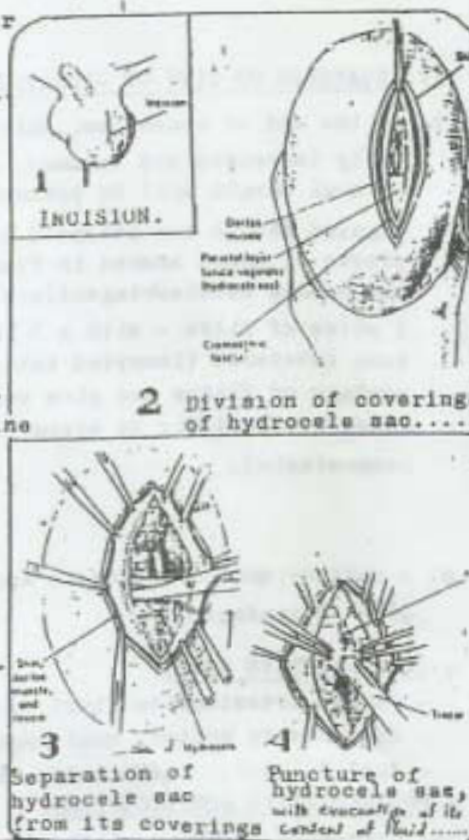
- On exposure of hydrocele sac, the following layers are incised:
 - 1- skin of scrotum.
 - 2- Dartos muscle: lies in S.F.
 - 3- External spermatic fascia, cremasteric fascia and internal spermatic fascia: usually as one layer.
- After exposure, the hydrocele sac lies anterior to testis covering its anterior, medial and lateral walls. It contains a clear serous fluid (very rarely, it may lie posteriorly).

REPAIR OF HYDROCELE:

- **ANAESTHESIA:** general, spinal or local .
- **POSITION:** Supine.
- **TECHNIQUE:**

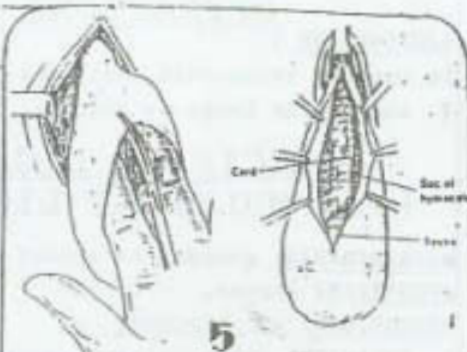
I EXPOSURE OF HYDROCELE SAC:

- 1- Incision -Scrotal incision: either : anterolateral vertical or anterior transverse.
- 2- Incision of coverings of testis in the same line of skin incision:
 - Dartos muscle: lies in S.F.
 - Ext. spermatic F., cremasteric F. and int. Spermatic F. as one layer.
- 3- Separation of hydrocele sac from coverings of testis all around....
- 4- Puncture of hydrocele sac anteriorly and suction of its containing fluid .



II REPAIR OF HYDROCELE SAC:

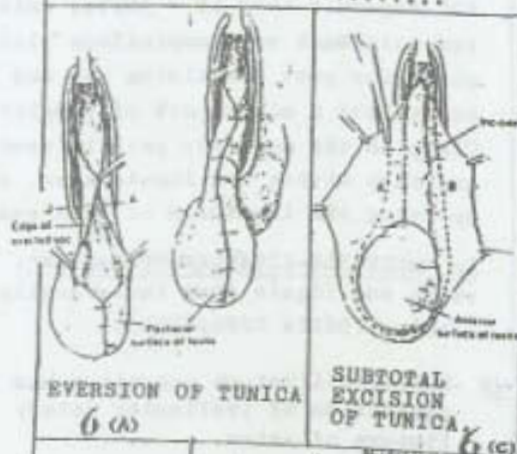
5. Site of puncture is extended superiorly and inferiorly to expose testis and cord and to deliver them.
6. Tunica is dealt with either by:
 - (A) **EVERSION OF TUNICA** - edges of tunica are sutured together "behind" the testis.
 - (B) **LORD'S OPERATION (FLICATION OF TUNICA)** - edges of tunica are plicated into a roll around testis.
 - (C) **SUBTOTAL EXCISION OF TUNICA** - edges of tunica are excised close to epididymis leaving a rim of only 2 mm.
7. Haemostasis is done and testis is pushed in. Put a Drain through scrotal wound (in its upper angle) for 24-48 hours.



Incision of hydrocele sac superiorly and inferiorly to expose testis and cord.



Delivery of testis to deal with tunica.....



EVERSION OF TUNICA

SUBTOTAL EXCISION OF TUNICA

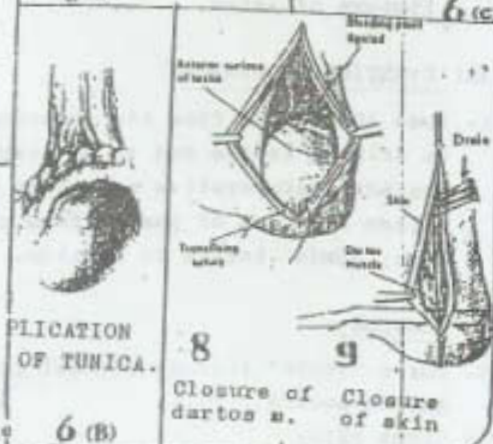
III CLOSURE OF WOUND: in 2 layers:

8. Dartos muscle.
9. Skin edges.

IV ELEVATION OF SCROTUM: On

10. elastoplast bridge across thighs (for 48 hours).

NB: Scrotum is supported for 1-2 weeks.



PLICATION OF TUNICA.

8

Closure of dartos m.

9

Closure of skin

OPERATIONS FOR VARICOCELE

INDICATIONS :

In primary varicocele, only when it is :

1. Abnormally large or painful. 2. Associated with oligospermia.

EXCISION LIGATURE OPERATION (and MULTIPLE LIGATURE OPERATION)

ANÆSTHESIA: general or spinal or local.

POSITION: supine.

TECHNIQUE: I EXPOSURE :

- 1- INCISION: Anterolateral vertical incision in the neck of scrotum. It is deepened (through dartos muscle...) to expose spermatic cord (coverings & contents).
- 2- Incise the coverings of spermatic cord to expose its contents. Coverings are 3 layers :
 - . External spermatic fascia.
 - . Cremaster muscle and fascia.
 - . Internal spermatic fascia.*Pampiniform plexus of veins (site of varicocele) is one of prominent contents of Cord.*

II EXCISION-LIGATION OF VEINS:

- 3- In EXCISION-LIGATURE OPERATION: Expose contents of cord and separate them in 2 parts: Anterior part containing the main bulk of "pampiniform plexus of veins" and the posterior part containing vas and its artery, testicular artery and a minor part of pampiniform plexus of veins. Clamp on the anterior part between 2 Kocher's forceps, and then divide and ligate them. Approximate the ends by tying the ligatures of both ends.

In "MULTIPLE-LIGATURE OPERATION": Identify plexus of veins and ligate them individually at level of neck of scrotum (DELTA OPERATION).

NB. Multiple-Ligature operation has the advantage of protection of testicular artery from injury during ligation of veins.....

III EVERTION OF TUNICA:

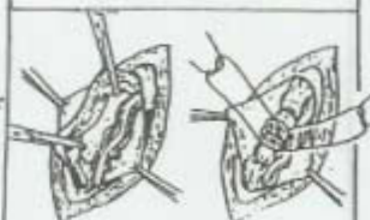
- 4- Free the tunica from its coverings by blunt dissection to deliver testis and to do eversion of tunica (to prevent postoperative secondary hydrocele that may follow ligation of pampiniform plexus of veins.....). Then, admit testis to scrotum.

IV CLOSURE :

- 5- Put a "drain" through scrotal incision and close the dartos muscle.
- 6- Close skin.

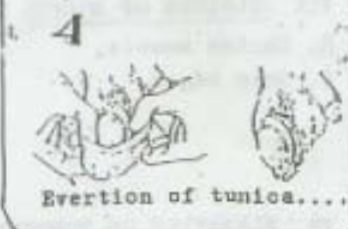


1 INCISION



Ligation and Excision of anterior part of PAMPINIFORM PLEXUS of veins.

3



Eversion of tunica....

4

HIGH LIGATION and STRIPPING OF LONG SAPHENOUS VEIN

INDICATIONS:

All cases with retrograde flow should be treated by subcutaneous stripping of the whole vein.

REVISION OF ANATOMY OF LONG SAPHENOUS VEIN :

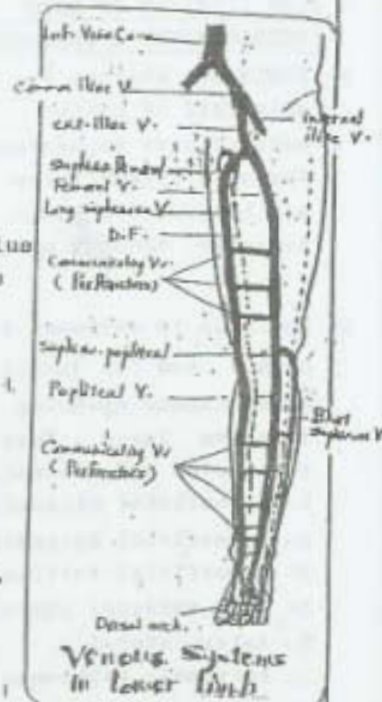
- It is a superficial vein i.e. runs superficial to D.P.
- It starts on dorsum of foot at medial end of dorsal venous arch, ascending to leg ANTERIOR to medial malleolus. Then, ascends medially on leg and thigh until it reaches saphenous opening, (an opening in D.P. of thigh) where it enters FEMORAL VEIN and receives many tributaries from the surrounding area.
- It receives many tributaries :
 - . at its start above medial malleolus.
 - . at its end : at saphenous opening.
- There are many "perforators" (connecting saphenous vein to deep veins) along its course. Some of them have fixed sites, while others have variable sites anatomically.....

To strip the long saphenous vein.....:

- I. EXPOSURE OF LONG SAPHENOUS VEIN :** is at its start (above medial malleolus) and at its end (at saphenous opening) where it is divided and ligated and their tributaries are also ligated and divided (in both sites).

II. DURING STRIPPING OF VEIN:

Perforators are not ligated or divided, but they are avulsed and compressed rapidly by a pressure bandage.



HIGH LIGATION and SUBCUTANEOUS STRIPPING OF LONG SAPHENOUS VEIN

• **ANAESTHESIA:** general or spinal .

• **POSITION:** Supine.

• **TECHNIQUE:**

I HIGH LIGATION OF LONG SAPHENOUS VEIN

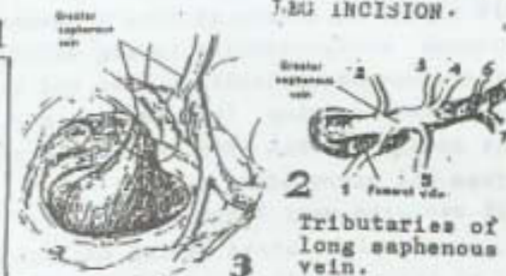
(TRENDLENBURG'S OPERATION):

- 1- **INCISION:** Oblique in skin fold of groin-centred over saphenous fossa (2 Finger below and lateral to pubic tubercle) about 5 cm. long.



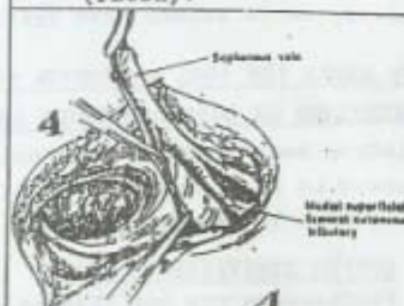
- 2- Incision is deepened to expose long saphenous V. and its junction with femoral V. at saphenous opening to expose its tributaries there. These tributaries must be ligated and divided:

- 1- Superficial circumflex iliac V.
- 2- Superficial epigastric V.
- 3- Superficial external pudendal V.
- 4- Deep external pudendal V.
- 5- Anterolateral V.
- 6- Posteromedial V.
- 7- Accessory saphenous V.



Ligation and division of long saphenous vein (PLUSH).

- 3- Double ligation and division of long saphenous V. "Plush" with its junction with femoral V.



- 4- Dissect distal end of long saphenous V. ligate and divide, its large medial tributary (Medial superficial femoral cutaneous V.) to prevent post-operative haematoma after stripping!

Dissection of saphenous vein distally till ligation all of its tributaries.....

II STRIPPING OF LONG SAPHENOUS V. :

- 5- Incision (small transverse) just above medial malleolus to expose long saphenous V. and to ligate and divide its distal end.



5 exposure of distal end of long saph.v. just above the medial malleolus.

- 6- Ligate and divide all tributaries at distal end of long saphenous V.

NB. Dissect proximally above medial malleolus for 4 cm to ligate and divide anterior and posterior tributaries.



6 Ligation and division of all of tributaries distally.

- 7- Incision (Small longitudinal) in wall of distal end of saphenous vein to introduce the small end of "Stripper" through it.

Then, Push the Stripper into saphenous V. gently with guidance by palpating finger, until its small end appears from upper end of saphenous Vein.

- 8- Pull the stripper until its bulky lower end lies snugly against the incision in lower part of saphenous vein. Then, tie silk ligatures around its lower end to fix it in place.

- 9- Pull the stripper again from its upper end to strip lower 6 cm of saphenous V. upwards to a subcutaneous position. Then, close the lower incision and start to apply the "pressure crêpe bandage".

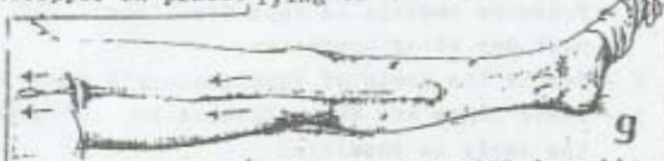
- 10- Pull the stripper upwards in stages: after each pull, extend the "pressure bandage" upwards to compress perforators and to prevent the hematoma formation, until application of the bandage from ankle to groin - ended by closure of Trendelenburg's wound in thigh with a subcutaneous drain (removed after 48 hours).



7 Pushing of STRIPPER in distal end of saphenous vein.



8 Tying of lower end by silk



9 Pulling of STRIPPER from its upper end to strip lower 6 cm.



10 Application of bandage from ankle to groin.....



10 Application of bandage from ankle to groin.....
not the drain in Trendelenburg's wound in the thigh.

STRIPPING OF SHORT SAPHENOUS VEIN

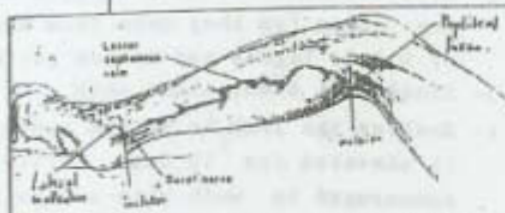
- ANAESTHESIA: general or spinal,.
- POSITION: prone - flexing the knee 90°.
- TECHNIQUE:

I LIGATURE-DIVISION OF SAPHENO-POPLITEAL JUNCTION:

- 1- INCISION: Transverse incision in middle of popliteal fossa to expose short saphenous V. and to follow it through D.F. to popliteal V.
- 2- Ligate and divide short saphenous Vein "Flush" with popliteal Vein.

II STRIPPING OF SHORT SAPHENOUS V. :

- 3- Expose distal end of short saphenous V. at ankle region through a 2 cm transverse incision above



Site of incisions in case of STRIPPING of short saphenous vein.



Pushing of STRIPPER from the lower end of short saphenous vein.

tip of lateral malleolus and lateral edge of tendo-Achillis. (Avoid damage of SURAL N.). Divide and ligate its tributaries in this region.

4- A small longitudinal incision is made in distal part of saphenous vein to insert a "short stripper"...

5-10 - The same steps as in stripping of long saphenous V. are done.....

● OPERATIVE COMPLICATIONS DURING "STRIPPING OF LONG SAPHEOUS V.":

- 1- Damage to femoral V. during high ligation of long saphenous V.
- 2- Damage to saphenous N. (in the leg) during dissection of lower part of long saphenous V.
- 3- Haematoma formation: along line of long saphenous vein in thigh.

● POSTOPERATIVE CARE:

- 1 - Pressure bandage is kept for 7 days, but patient is allowed out of bed next day after operation.
- 2 - Remove the drain of trendlenburg's wound after 48 hours.
- 3 - Lower limb is kept elevated 10-15° until patients becomes ambulatory (as early as possible).

SUBFASCIAL LIGATION OF PERFORATING VEINS

Indicated in varicose ulcer, gravitational ulcer and post-phlebitic leg.

● ANESTHESIA: spinal or general.

● POSITION: Supine

● TECHNIQUE:

- 1- Incision: starts half way up the leg-extending one inch behind and parallel to posterior border of tibia down to a point just behind medial malleolus.

NB: If there is an 'unhealed ulcer', it should be encircled by incision and the resulting defect is grafted after few days.....

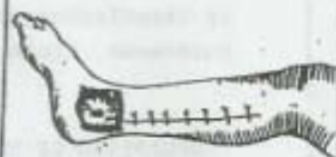
- 2- Lift the anterior flap of D.F. up to expose perforating veins (as they pass from muscles to deep surface of D.F.). Ligate and divide perforating veins.

- 3- Close D.F. then, close skin.

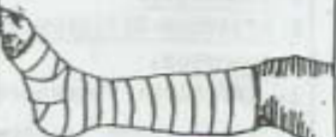
- 4- Enclose the limb in a firm pressure bandage and keep it elevated for 10 days (after which patient is encouraged to walk with a firm elastic bandage, which is worn for at least one month, then gradually discarded).



Perforators which are ligated under deep fascia

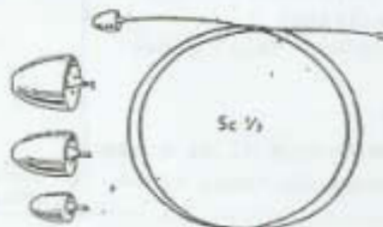


Closure of skin with drainage.



Application of a pressure bandage.....

VEIN STRIPPER



AMPUTATION

INDICATIONS :

1- ISCHAEMIA and GANGRENE : ($\frac{2}{3}$ of indications)

In 'sterile gangrene', amputation is delayed until a "line of demarcation" has formed - but in 'infective gangrene', 'urgent amputation' is necessary.

2- TRAUMA :

- Irreparable damage of a limb needs 'urgent amputation' (1ry amputation).
- Ischaemic gangrene, uncontrollable secondary haemorrhage complicating a compound fracture may need 'delayed amputation' (2ry amputation).

3- TUMOURS : (malignancy of bones and soft tissues)

Curable in early cases and palliative in late cases.

4- INFECTIONS: mainly.

- . Gas gangrene. . Madura foot.
- . Intractable bone or joint infections with bad general condition.
- . Extensive chronic ulcers in bed- ridden patients.

Amputation may be:

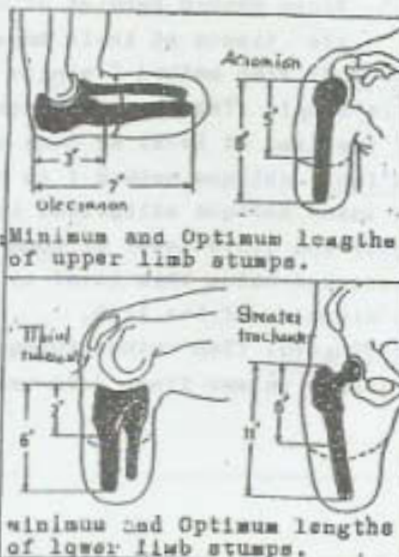
1. PROVISIONAL AMPUTATION = urgent amputation to control infection and correct general condition- followed by well- planned reamputation.
It is indicated if there is severe infection in the limb. In this case, amputation is not necessarily through the healthy limb above infected area, but it is done as low as possible to permit a reamputation at the optimum level. It should provide free drainage so that its flaps are left without closure. After correction of general condition and control of infection, a DEFINITIVE AMPUTATION is done (to give an "Ideal stump").
2. DEFINITIVE AMPUTATION: When conditions are optimum and primary healing will be sure, amputation should be well- planned to provide an "ideal stump".

CHARACTERS OF IDEAL STUMP:

1- LENGTH: Standard lengths are:

- . Above-elbow stump: length from "ACROMION" ;
* Minimum 5 inches * optimum 8 inches .
- . Below- elbow stump: length from OLECRANON:
* Minimum 3 inches * Optimum 7 inches .
- . Above-Knee stump: length from GREATER TROCHANTER:
* Minimum : 6 inches * Optimum 11 inches .
- . Below-knee stump: length from TIBIAL TUBEROSITY:
* minimum: 2 inches. * Optimum 6 inches.

2- SHAPE: Smoothly rounded and conical.



- 3- COVERINGS - Bone should be covered with subcutaneous tissue and deep fascia to ensure mobility of skin. No muscles should be included (because it will be soon transformed into fibrous tissue which becomes adherent and tender!).
- 4- SCAR: Linear, freely movable and not exposed to pressure.
In upper limb: a "TERMINAL" Scar is satisfactory.
In lower limb: a "POSTERIOR" Scar is preferred.
- 5- FUNCTION: Stump should be:
. Painless.
. With a freely movable joint above and a smooth bone end below.

METHODS OF AMPUTATION:

*In Upper limb:

- . Circular method = skin incision is distal to level of bone section.
- . Racket method = skin incision is in form of a "Racket": its handle is proximal and its blades are distal giving equal flaps.
- . Flap method: "equal flaps" may be used.

*In lower limb:

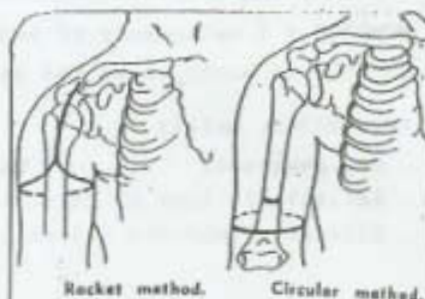
- . Flap method: (Most popular)
(Unequal flaps is preferred).
- Observe the following RULES in making flaps:
 - 1- flaps should be semicircular not rectangular
 - 4- Combined length of 2 flaps = diameter of limb at level of bone section.
 - 5- Length of equal flaps = $\frac{1}{2}$ circumference of limb.
If unequal flaps, shorter flap is broader than the other flap so that skin edges to be sutured will be equal.
 - 2- Flaps should anteroposterior \rightarrow "transverse scar", and with a longer anterior flap \rightarrow "posterior scar".
 - 3- Flaps should consist of skin, D.F. with some muscle tissue at their bases, but No muscles.

*In Hand: Flap method (single flap) is used.

This single flap should be equal to diameter of the limb at level of bone section.

*In foot: oblique method (in Syme's amputation) is used = oblique elliptical incision with its upper end above level of bone section and its lower end below this level by a distance equal to diameter of the limb.

*In Fingers: flap method (unequal flaps with a longer palmar flap) is used.



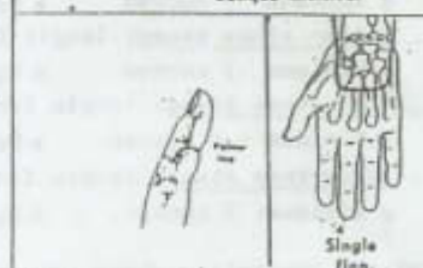
FLAPS in above-elbow amputation



FLAPS in above-knee amputation



Oblique method.



FLAPS in hand, finger and foot.

ABOVE-KNEE AMPUTATION

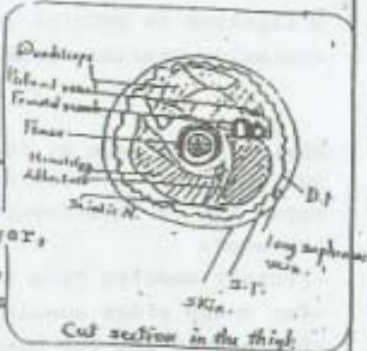
INDICATIONS : as before...

REVISION OF ANATOMY OF THE THIGH AT LEVEL OF AMPUTATION.

Imagine the CUT SECTION of the thigh at the junction of its middle with lower $\frac{1}{3}$. Layers of the section are :

- 1- Skin.
- 2- S.P. containing long saphenous V. (medially).
- 3- D.P. (thickened laterally to form iliotibial tract).
- 4- Muscles : anteriorly : quadriceps.
 medially : adductors.
 posteriorly : hamstrings.
- 5- Vessels and Nerves : Femoral vessels - Sciatic nerve.
- 6- Femur covered by its periosteum.

During amputation, these layers are incised layer by layer, and vessels and nerve are ligated and divided carefully, untill reaching femur which is bared from its periosteum and sawn with a "saw".



ABOVE-KNEE AMPUTATION

ANAESTHESIA: general or spinal.

• POSITION : supine.

●TECHNIQUE :

Tourniquet is used (except in ischaemic cases).

1- PLANNING FOR INCISION :

- Determine LEVEL of bone section (=length of stump) and mark it on skin : from tip of GREATER TROCHANTER minimum 6 inches (15 cm) and optimum 11 inches (25cm) Roughly, at junction of lower $\frac{1}{3}$ and middle $\frac{1}{3}$ of the thigh.

NE level is the same in children because upper end of femur is NOT the growing end.

.Outline the SKIN PLAPS; they should be :

- Unequal Anteroposterior = long anterior flap($\frac{2}{3}$) and short posterior ($\frac{1}{3}$) → "transverse posterior scar"
- Total length of both flaps = $\frac{1}{2}$ circumference of the thigh at level of bone section (measured by a silk thread)

2- INCISION : incise skin, S.P., and D.P. as one flap and raise it. (D.P. should be included in flaps to maintain their blood supply and prevent adherence of bone to the scar).

NB. Ligate and divide long saphenous vein (medially in the thigh, superficial to D.F.).

After raising flaps, muscles of thigh will be exposed:



1.2 INCISION



Incision of DEEP FASCIA
to be included in the flap.

3-Divide muscles of thigh all around down to periosteum of femur, at a lower level than site of bone section.
(During this step, step 4 is done).

4-Identify and then divide and ligate vessels of thigh:
Femoral vessels are medial to vastus medialis and in front of adductor longus.
Sciatic nerve is divided cleanly without any crushing or ligation to prevent irritation of nerve fibres and excessive neuroma formation .

5-Divide periosteum at the same level of bone section and strip it a little upwards and then perfectly downwards and cut the femur transversely using an "amputation saw".

- Protect muscles from saw dust by retraction,....
- Any sharp ridge should be bevelled.
- Use a bone wax for haemostasis of bone marrow.
- Remove the tourniquet and do haemostasis by ligation of muscular and small vessels.



3 Incision of MUSCLES.



4 Ligation of FEMORAL VESSELS and SCIATIC N.

6-Approximate muscles and carefully close D.P. leaving a gap at either end to introduce "subfascial drains" from ends of wounds.



5 Incision and Elevation of periosteum from femur.

Sawing of femur

7-Close skin and apply a "pressure dressing" (bulky cotton wool dressing) and the stump is firmly bandaged from above downwards.
Drains should project through the bandage so that it can be removed later without disturbance of the dressing.



6 Closure of DEEP FASCIA.

(drain is put.) then of skin

POSTOPERATIVE CARE :

- 1-Immobilization of the limb for at least 10 days, after which patient is encouraged to move the joint above stump and to do exercises.
- 2-Remove drains after 24-48 hours without removal of dressings and remove stitches after 10 days. Then, apply a firm crêpe bandage to the stump.
- 3-Artificial limb (permanent) may be fitted after 3-6 months.



7 Dressing of wound

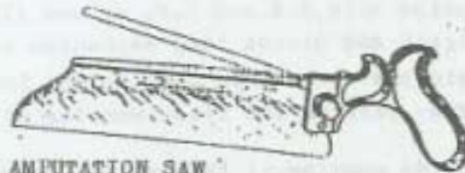
COMPLICATIONS :

- 1- Wound: hematoma, infection, necrosis of flaps or adherent scar to underlying bones...
- 2- Soft tissues: Ulceration of Stump, ...
- 3- Nerves:
 - . Phantom limb = a "conscious" feeling of the missing limb, for some time after operation- then it fades gradually.
 - . Stump neuroma = a swelling at end of the divided nerve - usually symptomless unless irritated by ...
 - . Causalgia = severe burning pain due to formation of artificial synapses between efferent sympathetic fibres and afferent sensory fibres- usually relieved by 'sympathectomy'.
- 4- Bone:
 - . Necrosis of bone end 2ry to wound infection
 - . Spur formation due to excessive stripping of periosteum upwards or contamination of soft tissues by bone dust.
 - . Projecting bone end from use of short flaps or from continued growth of bone in children.
- 5- Joint Deformity : from overaction of stronger muscle groups or from immobilization of stump in a faulty position.

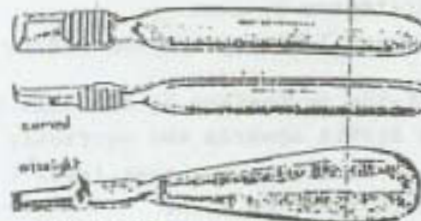
SPECIFIC INSTRUMENTS USED IN " AMPUTATION "



AMPUTATION KNIFE



AMPUTATION SAW



PERIOSTEAL ELEVATOR

BELOW-KNEE AMPUTATION

•• ANAESTHESIA and POSITION : as before.

• TECHNIQUE :

Tourniquet is used (except in ischaemic cases).

1-PLANNING FOR INCISION :

.Determine level of bone section (length of stump) and mark it on skin as before : from TIP OF TIBIAL TUBEROSITY ; minimum 2 inches (5 cm.) and optimum 6 inches (15 cm). Roughly, at junction of upper $\frac{1}{3}$ and middle $\frac{1}{3}$ of the leg.

NB, Level in children must be SHORTER by 3 cm., because upper end of tibia is the growing end and if soft tissues are not left longer than the bone, the growth of bone will result in perforation of skin.

.Outline skin flaps : they should be:

- Equal Anteroposterior \rightarrow "Transverse Terminal scar".

It is equal flap because its stump is "side-weight bearing" i.e. the weight of the body is transmitted to the artificial limb via sides of tibial condyles and so, the end of stump does not transmit the weight and so the scar must be a "terminal" one.

- Total length of both = $\frac{1}{2}$ the circumference of leg at level of bone section (measured by a silk thread).

2- INCISION :

Incise skin, S.P. and D.P. as one flap and raise it.....

Ligate and divide long saphenous vein medially and short saphenous vein posteriorly in S.P. during incision....

After raising the flap, muscles of the leg are exposed.

3- Divide muscles of the leg all round down to the periosteum of bone at a lower level than the site of bone section (during this step, step 4 is done).

4- Identify and then divide and ligate vessels of the leg :

.Anterior tibial vessels : in front of interosseus membrane

.posterior tibial vessels: at lateral border of tibia, deep to flexor digitorum longus.

.Peroneal Artery : on the fibula deep to tibialis posterior muscle.



5- Divide periosteum at the same level of bone section and strip it for a little upwards and perfectly downwards . Cut tibia transversely, but cut fibula at a higher level (1 cm above tibia) so that it will not perforate the skin.

.Protect muscles from saw dust by retraction.....

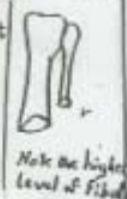
.Anterior border of tibia (subcutaneous) must be REVELLED so that it will not perforate skin after that by pressure atrophy.

Also, any sharp edge in both bones should be bevelled.

.Use a bone wax for haemostasis of bone marrow.

.Remove tourniquet and do haemostasis.....

6, 7 - as in Above- knee amputation.



INSTRUMENTS

I- Instruments for general use.

II- Instruments used in gastro-intestinal surgery.

III- Instruments used in urological surgery.

IV- Instruments used in vascular surgery.

V- Instruments used in cardio-thoracic surgery.

VI- Instruments used in neuro-surgery.

II- Instruments used in orthopaedic surgery.

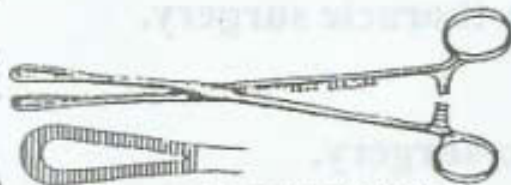
I INSTRUMENTS FOR GENERAL USE

FOR PREPARATION OF THE FIELD :



VARIOUS TYPES OF TOWEL CLIPS.

- . to fix towels to skin in operation
- . to prevent slipping of towels.



SPONGE-HOLDING FORCEPS

to hold pieces of gauze for cleaning skin or for mopping away blood from the depth of operative field.

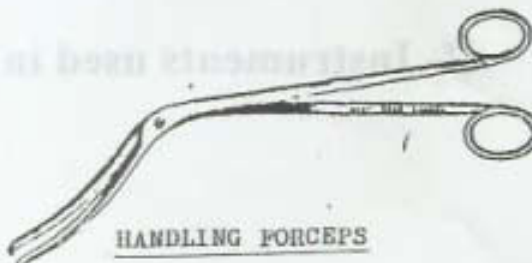


DRESSING FORCEPS

to apply antiseptics and dressings.



HANDLING FORCEPS



HANDLING FORCEPS

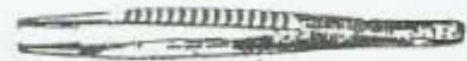
(always its blades are immersed in a jar of antiseptic solution).

to carry sterile instruments, towels and dressings by nurses (2 types).

FOR EXPOSURE AND DISSECTION :



VARIOUS TYPES OF SCALPEL (KNIFE)



TOOTHED DISSECTING FORCEPS
-to hold tough structures during dissection.....



NON-TOOTHED DISSECTING FORCEPS

- 1-to hold delicate structures during dissection.....
- 2-in dissection of delicate structures e.g.hernial sac.

Mickel's clips



Carrier forceps

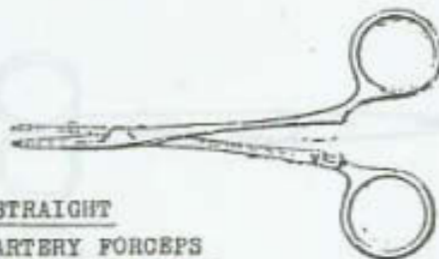


Applying forceps

MICKEL CLIPS APPARATUS

for skin closure by Mickel's clips(excellent cosmetically).

STRAIGHT
ARTERY FORCEPS



CURVED
ARTERY FORCEPS



- 1-in catching a vessel (by its tip)
- 2-in clamping a vessel between 2 artery forceps and then dividing it between them.(by its side).
- 3-in traction on aponeurosis or peritoneum.
- 4-in holding pieces of tissues e.g. piles.
- 5-as a dressing forceps.

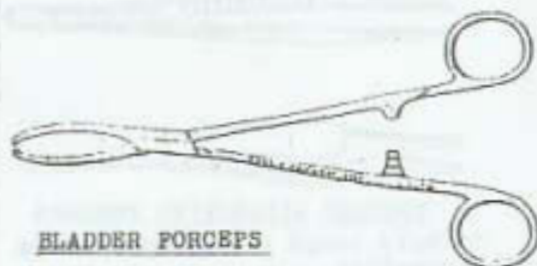
KOCHER'S FORCEPS

- 1- in traction on tough structures e.g.rectus sheath in paramedian incision.....
- 2- in clamping a vascular pedicle, omentum or bands.
- 3- in crushing base of appendix before ligation, or pedicle of pile before transfixion.

SINUS FORCEPS

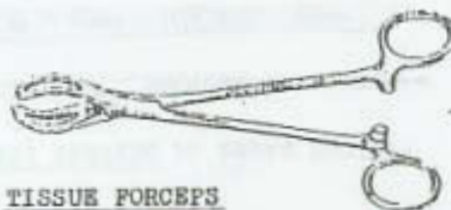


- 1- to open abscesses by Hilton's method.
- 2- to explore sinuses.



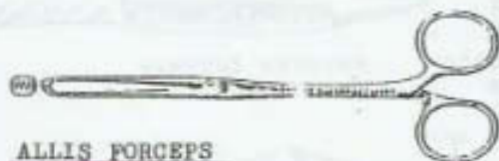
BLADDER FORCEPS

to hold bladder wall, muscles and sometimes skin edges (NOT injurious).



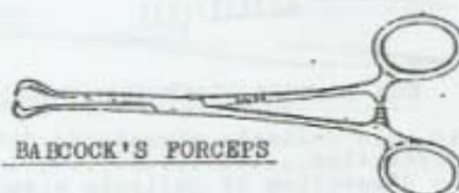
TISSUE FORCEPS

to hold skin, fascia and aponeurosis. (INJURIOUS to tissues....)



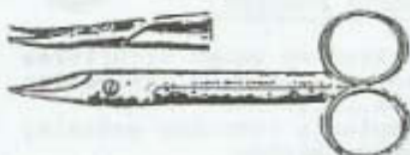
ALLIS FORCEPS

to hold intestines and peritoneum. (NOT injurious).



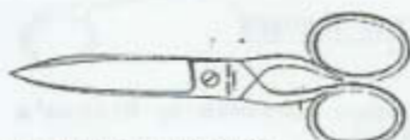
BABCOCK'S FORCEPS

to hold (and fix) stomach, intestine and colon (NOT injurious).



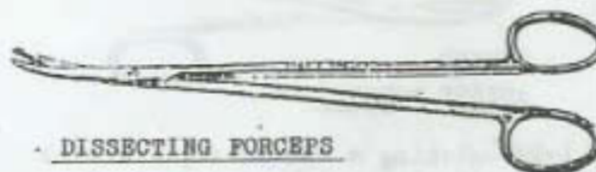
STITCH SCISSORS

to remove stitches.



DRESSING SCISSORS

to divide dressings.



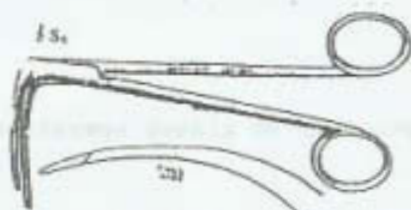
DISSECTING FORCEPS

to dissect and divide tissues.



ANEURISM NEEDLE

to pass ligatures around blood vessels and pedicles e.g. around superior thyroid vessels in thyroidectomy.....

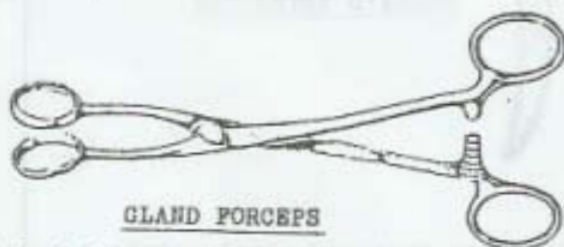


CLEVELAND'S FORCEPS NEEDLE



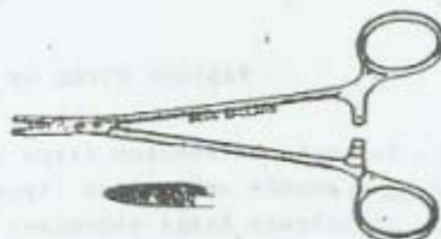
TONGUE FORCEPS

to pull out the tongue under anaesthesia and in comatose patients to clear air passages.... NOT used for tongue surgery!



GLAND FORCEPS

- to hold parotid glands, lymph nodes and small tumours.
- to hold thyroid gland in cases of retrosternal extension.



TYPES OF NEEDLE HOLDERS

to hold needles during suturing....



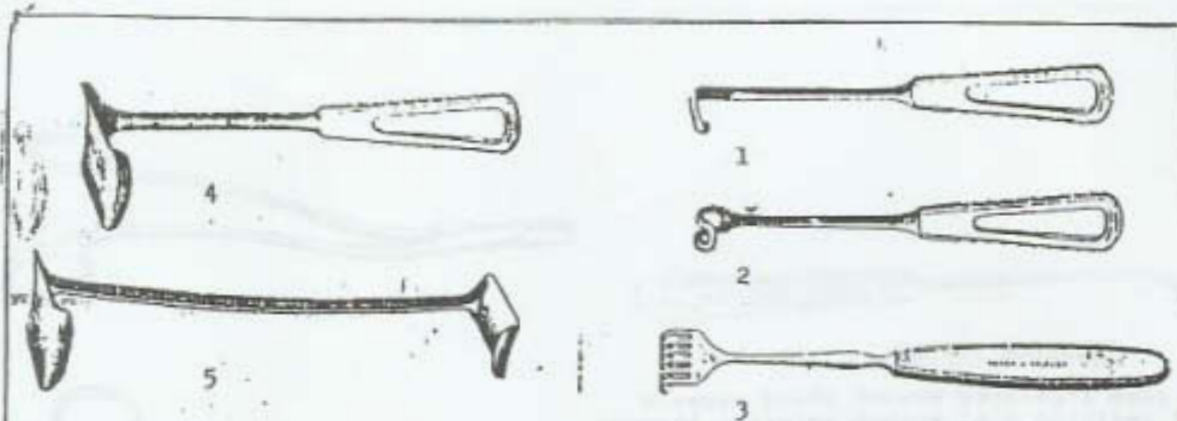
CURETAGE SPOONS

- to curette granulation tissue and
- to take pus from suppurations for culture and sensitivity tests.



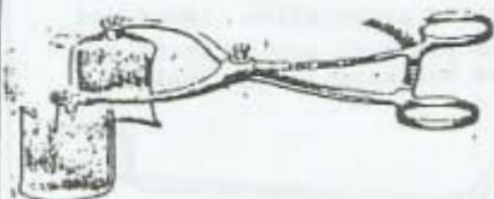
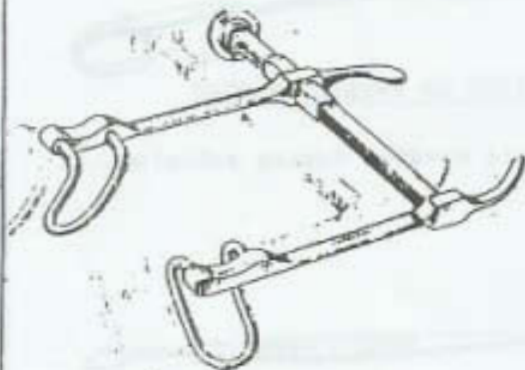
RING FORCEPS

- to hold ureter in its operations;
- to hold spermatic cord " " " "



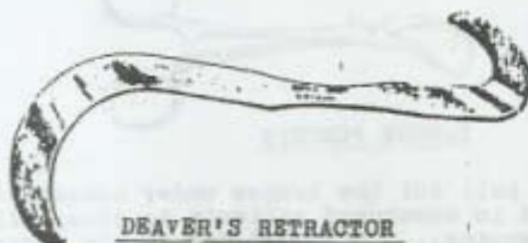
VARIOUS TYPES OF RETRACTORS

- 1- for skin retraction (type 3).
- 2- for muscle retraction (types 1, 2).
- 3- to retract large abdominal wounds e.g. laparotomy or kidney operations.
- (types 4 and 5)



SELF-RETAINING ABDOMINAL RETRACTORS

to widen and clear the field in operations like colectomy and abdomino-perineal resection of rectum.

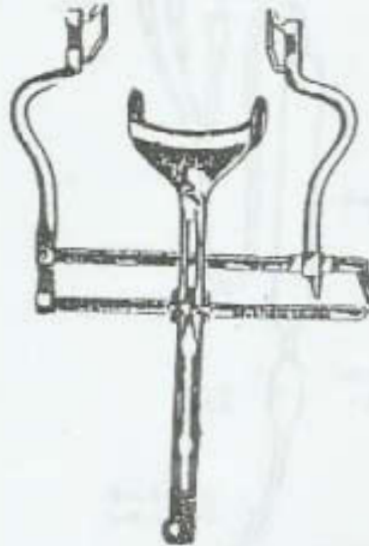


DEAVER'S RETRACTOR

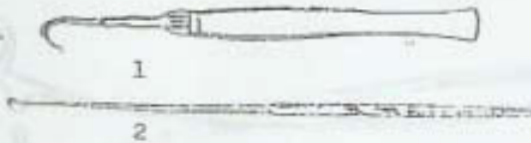


KELLY'S RETRACTOR

to retract deep abdominal wounds e.g. in splenectomy, cholecystectomy and pelvic operations.



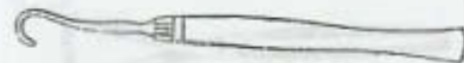
SELF-RETAINING ABDOMINAL RETRACTOR



SHARP-POINTED HOOK

Type 1 : in tracheostomy, to steady the cricoid cartilage.

Type 2 : in plastic surgery, to retract skin.



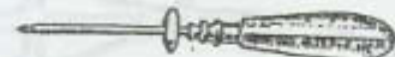
BLUNT-POINTED HOOK

to retract vessels, nerves and tendons e.g. in sympathectomy.



DISSECTORS

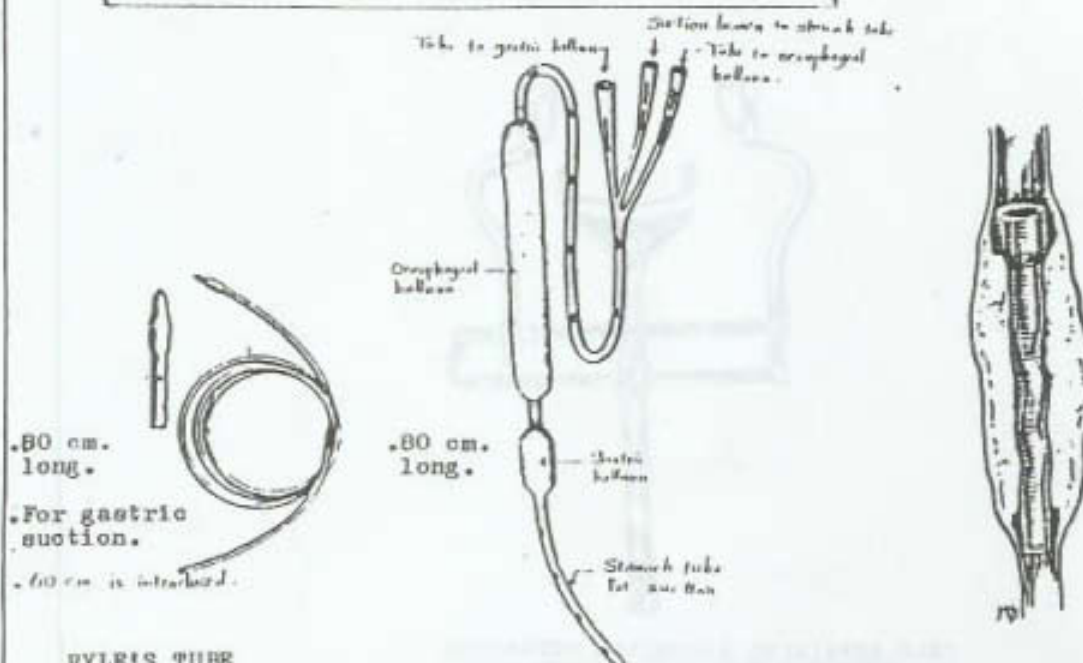
to separate tissues covering delicate structures as vessels, nerves and tendons.



TROCAR AND CANNULA

to aspirate hydrocele, ascitis and in acute empyema.

II INSTRUMENTS USED IN GASTROINTESTINAL SURGERY :



RYLE'S TUBE

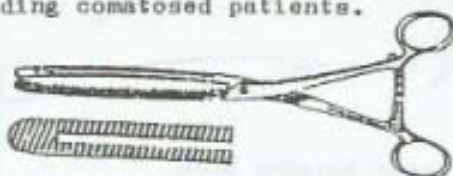
- Diagnostic: to take a sample of gastric juice.
- Therapeutic: to treat paralytic ileus or acute gastric dilatation.
- Feeding comatose patients.

SENDESTAKEN'S TUBE

to stop severe bleeding from oesophageal varices.

SOUTTAR'S TUBE

in palliative treatment of oesophageal carcinoma.



NON-CRUSHING INTESTINAL CLAMP

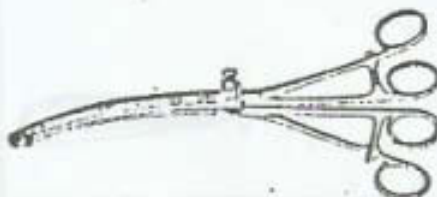
to steady intestine, control bleeding and prevent escape of its contents during intestinal op.

(note that intestinal clamp is smaller than gastrectomy clamp).



NON-CRUSHING GASTRECTOMY CLAMP

to steady stomach, control bleeding and prevent escape of its contents during gastric operations.



GASTRECTOMY TWIN CLAMP

(gastro-jejunostomy clamp)

to hold stomach and intestine during gastro-jejunostomy.
(it is 2 non-crushing clamps!).



CRUSHING INTESTINAL CLAMP

(PAYR'S CLAMP)

to crush duodenum in Billroth I operation.
(gastro-duodenal anastomosis).



STONE FORCEPS (DESJARDIN'S FORCEPS)

to remove stones from bile ducts.
Also, to remove stones from ureter.

CHOLECYSTECTOMY FORCEPS

to clamp cystic duct and cystic artery during cholecystectomy, and to pass ligatures around them.



BILE DUCT DILATORS (BAKES' DILATORS)

to dilate lower end of the bile duct.
to explore the common bile duct.



BILE DUCT SCOOP AND PROBE

to detect stones in the bile duct and
to remove small stones.



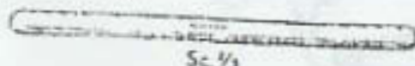
T-shaped TUBE

to drain common bile duct
after removal of a stone or
after exploration of common
bile duct. (left for 10 days).



PAUL'S TUBE

put in the loop
of colostomy and
tied by one end.
Other end is connected
to a colostomy bag.



COLOSTOMY GLASS ROD

passed through mesentery
of exteriorised loop to
prevent its slipping
inwards into abdomen.



ENTEROTOME

to crush the spur of a
double-barrel colostomy.



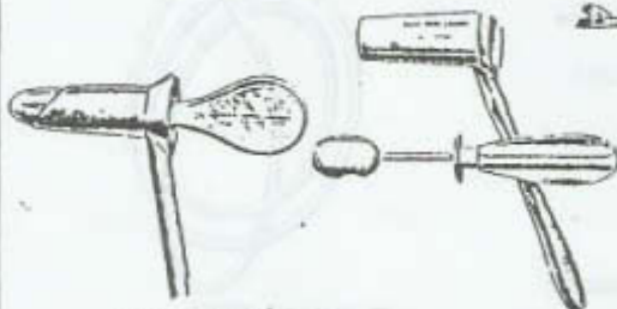
COLOSTOMY BAG

fitted over colostomy (or ileostomy)
to collect the intestinal excreta.



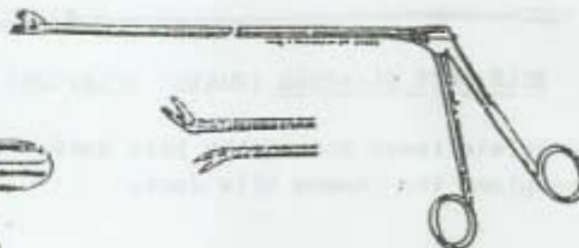
FISTULA DIRECTOR

to probe anal fistula to know its
level and direction.



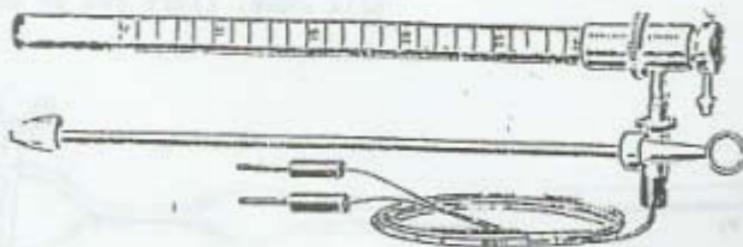
PROCTOSCOPE

to inspect mucosa of lower rectum and
anal canal : to diagnose 1st and 2nd
degrees piles, and to inject piles.::



BIOPSY FORCEPS

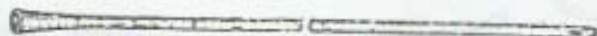
to take biopsies from tumours and
ulcers through the sigmoidoscope.



SIGMOIDOSCOPE

- to diagnose lesions of rectum and lower part of sigmoid colon.
- to take biopsy from suspected lesions.....
- to fulgurate or remove polypi by diathermy snare.

XII INSTRUMENTS USED IN UROLOGICAL SURGERY



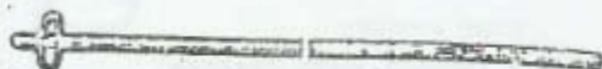
ORDINARY CATHETER

- Therapeutic : to drain urine in acute or chronic retention.
- Diagnostic : to take urine sample (for culture and sensitivity tests in females).



FOLEY'S CATHETER (self-retaining catheter)

- to drain urine in chronic retention.
- to control bleeding from prostatic bed after prostatectomy.
- as a splint for urethra in intrapelvic rupture urethra.



MALECOT SELF-RETAINING CATHETER



DE PEZZAR CATHETER (Self retaining)

- to drain urinary bladder in suprapubic cystostomy or prostatectomy.....
- to drain renal pelvis in nephrostomy or pyelolithotomy.....
- to drain pleura in acute empyema.



MALE METAL CATHETER

Only used when insertion of rubber catheters fails.(it is not used now after use of rubber catheters).



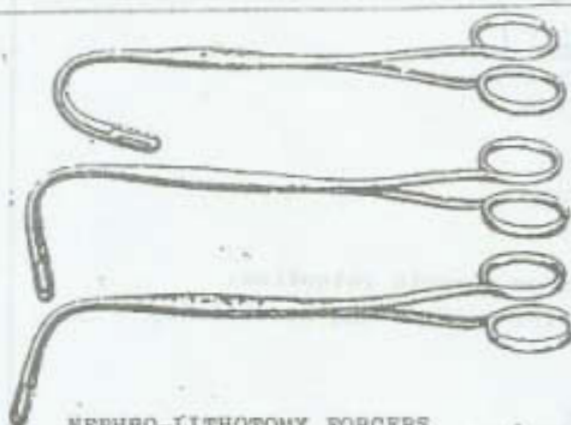
URETHRAL DILATOR

to dilate stricture urethra (passable permeable types).



URINARY BLADDER SOUND

- to detect stones of urethra or of urinary bladder.
- to test the patency of urethra.



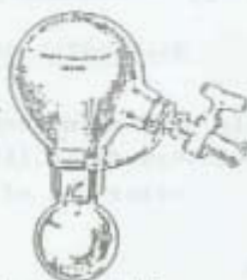
NEPHRO-LITHOTOMY FORCEPS
(stone kidney-removing forceps)

to pick stones from renal pelvis and calyces.

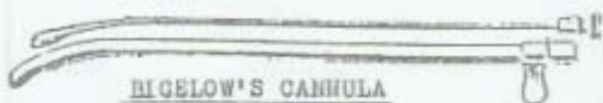


CYSTO-LITHOTOMY FORCEPS
(stone bladder removing forceps)

to remove stones from urinary bladder.



HIGELOW'S EVACUATOR



HIGELOW'S CANNULA

They are connected together to suck fragments of stone after its crushing.



URETERO-LITHOTOMY FORCEPS
(stone ureter removing forceps)

to remove stones from ureter.



RING FORCEPS
(Ali Ibrahim Bacha forceps)

to hold ureter during its operations.
to hold spermatic cord " " " "



LITHRITE

to crush stones of urinary bladder to be ready for suction by Higelow's evacuator.



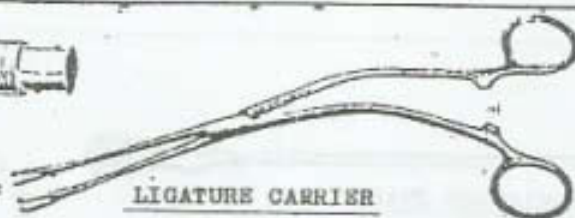
RENAL PEDICLE CLAMP

to clamp renal pedicle in nephrectomy.



BOOMERANG NEEDLE

to suture the raw surface of prostatic bed after prostatectomy.



LIGATURE CARRIER

to hold thread and insert it into the eye of boomerang needle.



BLADDER-NECK SPREADER

to expose neck of bladder during retropubic prostatectomy.



VOLSELLUM FORCEPS

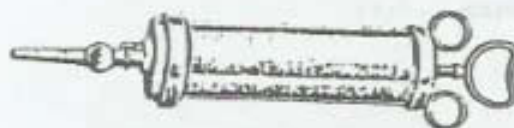
to hold prostate during prostatectomy.



CYSTOSCOPE

indications:

- 1- Haematuria to see if bleeding is vesical or ureteric.
- 2- Chronic cystitis to see its cause e.g. ulcer bladder, early tumour or bladder neck obstruction....
- 3- Cautery of ulcer bladder or papilloma.
- 4- For ureteric catheterization.



BLADDER SYRINGE

to wash bladder e.g. after prostatectomy.



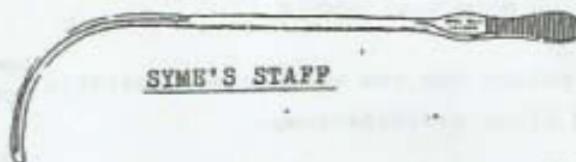
CROCODILE FORCEPS

to bring stones from penile urethra.



WHEELHOUSE STAFF

for Wheelhouse external urethrotomy in impassable, permeable stricture urethra (not allow passage of the instrument but allows the flow of urine).



SYME'S STAFF

for treatment of passable, permeable (allows passage of instrument and allows flow of urine) and complicated stricture e.g. by stone or fistula.



URINE COLLECTING BAG

Connected to urethral catheters and suprapubic tubes to collect urine.....



TEAL'S PROBE GORGET

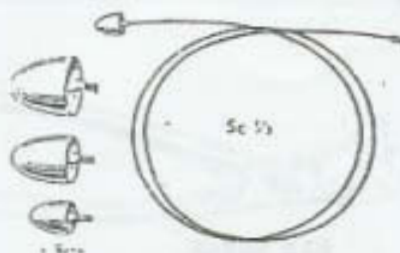
for Wheelhouse external urtherotomy.

III INSTRUMENTS USED IN VASCULAR SURGERY :



VEIN CANNULA

to introduce it into cephalic vein or long saphenous vein in venous cut-down.



VEIN STRIPPER

to strip long saphenous (or short saphenous) vein in varicose veins of lower limb.



VEIN CANNULA

to introduce it into any vein to give a patent venous-line!



BULLDOG CLAMP

(non-crushing arterial clamp)

for temporary occlusion of arteries during operations on arteries e.g. repair of injury, anastomosis, grafting or embolectomy.



SATINSKY'S VENA CAVA CLAMP

to isolate part of the wall of inferior vena cava to be anastomosed to portal vein in the porta-caval anastomosis.

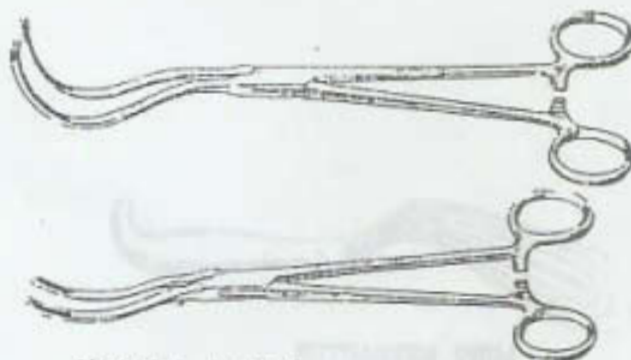


ARTERIAL

GRAFTS

(dacron or teflon).

to replace or by-pass the big arteries e.g. aorta, iliac.....



ARTERIAL CLAMPS

for temporary occlusion of large arteries as aorta, common iliac,..... in arterial operations as anastomoses, grafting or endarterectomy.

IN INSTRUMENTS USED IN CHEST SURGERY :



RIB SHEAR

to divide ribs (after stripping of its periosteum).



RIB RASPATORY
(Doyen's periosteal elevator)

to elevate periosteum from deep surface of ribs.



RIB SPREADER (RETRACTOR)

to pull apart the ribs in thoracotomy (self-retaining retractor).



RIB APPROXIMATOR

to approximate the ribs in thoracotomy to facilitate the closure of thoracotomy wound.



LUNG RETRACTOR

to retract lung during thoracotomy.



LUNG FORCEPS (DUVAL'S)

to hold lungs and bring it to deal with.....

INSTRUMENTS USED IN NEURO-SURGERY



MASTOID RETRACTOR

to retract edges of scalp wound during operations on skull and brain.



SERGENT'S SCALP FORCEPS

to arrest bleeding from scalp by everting edges of galea aponeurotica (it devitalises tissues so, it is not used now.....).



SKULL TREPHINE

to remove circular disc of bone from the skull.



HUDSON'S BRACE, PERFORATOR and BURR



HEY'S SAW

to divide flat bones e.g. mandible and skull.



GIGLI'S SAW and ITS GUIDE

to divide flat bones e.g. mandible and skull (between 2 burr holes) to raise an osteoplastic flap.



DURA SEPARATOR

to separate dura from skull bone.



GIGLI'S SAW with its 2 HANDLES.....

The "guide" (introducer) guides the gigli wire between trephine holes.



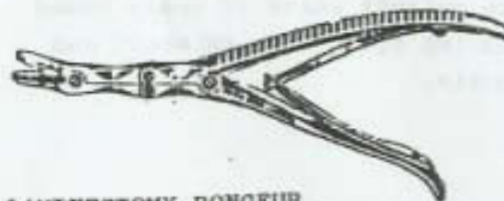
SKULL RONGEUR (BONE NIBBLING FORCEPS)

to widen the opening of trephine holes by excising its edges.



LAMINECTOMY SHEARS

to divide spinous or transverse processes in laminectomy.
Also, to divide ends of ribs.



LAMINECTOMY RONGEUR

to help in excision of laminae during laminectomy.

VI INSTRUMENTS USED IN ORTHOPAEDIC SURGERY :



BONE-CUTTING FORCEPS

- to divide bony edges and small bones.
- in CIRCUMCISION !

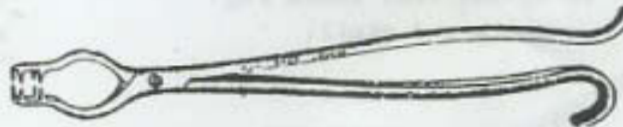


BONE CUTTING FORCEPS



BONE NIBBLING FORCEPS

to remove bony processes and reshape bones operated upon.



BONE HOLDING FORCEPS

to hold bones during operations.
(various sizes - biggest is used to hold femur).



SEQUESTRUM FORCEPS

to hold and remove sequestrum during sequestrectomy.



CURETTAGE SPOON

to scrap sinuses and cavities or granulation tissue.

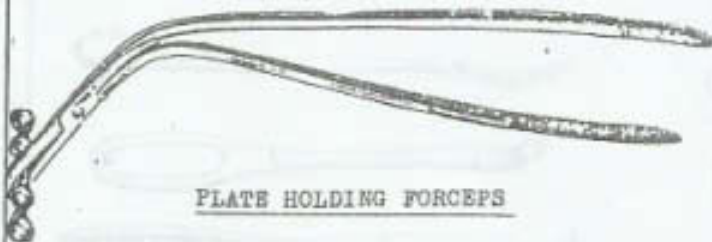


PLATE HOLDING FORCEPS

to fix the plate during insertion of screws.

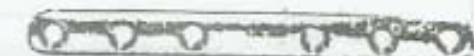


PLATE and SCREWS

for internal fixation of bones.



PLATE BENDER

2 of these are used to shape the plate to fit the contour of bone.



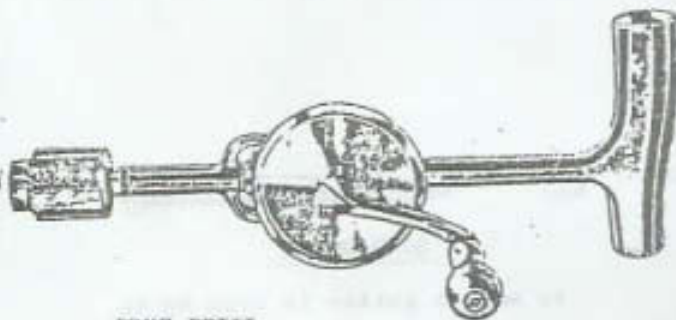
SCREW HOLDING FORCEPS

to steady the screw during its driving in.



SCREW DRIVER

to drive the screw into the bone.



BONE DRILL

to make drill holes e.g. for plate or for fixation of fracture of mandible...



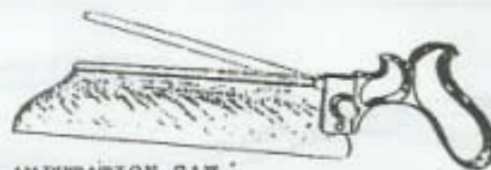
AUSTIN-MOORE HIP PROTHESIS

to replace head and neck of femur in fracture neck femur.....



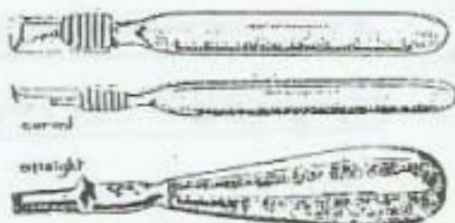
AMPUTATION KNIFE

to divide muscles, vessels, and nerves down to bone with one sweeping motion called "tour de main".



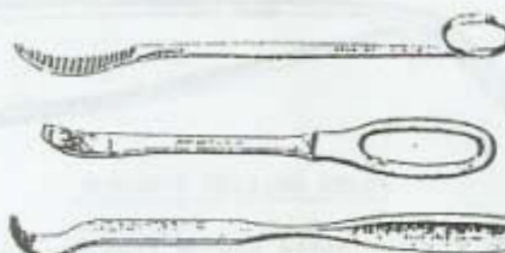
AMPUTATION SAW

to divide the bone in amputation.



PERIOSTEAL ELEVATOR

to strip periosteum from bone.



BONE LEVER

to elevate fragments of long bones during operation of internal fixation.



OSTEOTOME

to divide bone during osteotomy.



CHISEL

- to cut slices of bone to be used as grafts (usually from tibia).
- to remove exostosis or osteophytes.



MALLET

for hammering the osteotome, the chisel or the gauge.



BONE GAUGE

to make a gutter in bone as in sequesterectomy and saucerization in chronic osteomyelitis.

تم بحمد الله تعالى